FEB 2 2 1944

VOLUME 27 · NUMBER 2 · FEBRUARY 1944

AMERICAN JOURNAL OF OPHTHALMOLOGY

Medical Library

THIRD SERIES FOUNDED BY EDWARD JACKSON

CONTENTS

		PAGE
Techniques for eyelid reconstruction	*H. S. Sugar*	109
Intracapsular cataract extraction	*D. B. Kirby*	124
Ocular reaction to normal horse serum	*T. F. Schlaegel, Jr.*	137
Present limits of gonioscopy	*P. C. Kronfeld and H. I. McGarry*	147
Torsion without known eye defect	*T. G. Hermans*	153
Congenital myopia with convergent strabismus	*R. C. Gamble*	159
Coats's disease	*J. Laval*	163
Endogenous infection of the eye	*D. Kravitz and L. J. Duest*	167
Essential atrophy of the iris	*F. McK. Ruby*	171
Geographical distribution of ocular infections	*C. Weiss*	175
Naphthocaine as a local anesthetic	*R. A. Stewart*	178
Nominal duction and true duction power	*J. I. Pascal*	179

DEPARTMENTS

Society Proceedings	180
Editorials	187
Book Notices	191
Correspondence	192
Abstracts	193
News Items	215

For complete table of contents see advertising page V

Copyright, 1944, Ophthalmic Publishing Company, 837 Carew Tower, Cincinnati, Ohio

Subscription price in United States ten dollars yearly. In Canada and foreign countries twelve dollars. Published monthly by the George Banta Publishing Company, 450 Ahnaip Street, Menasha, Wisconsin, for the Ophthalmic Publishing Company. Subscription and Editorial Office: 837 Carew Tower, Cincinnati, Ohio. Entered as second class matter at the post office at Menasha, Wisconsin.

". . . And in today already walks tomorrow."
(COLERIDGE)

Plan Your Office of Tomorrow Now!

Tomorrow will bring many new innovations . . . professional offices will assume new arrangements, new equipment will be installed to meet post-war patient demands.

Although today, ophthalmic instrument deliveries are uncertain and many pieces are listed "not available", refractionists are looking ahead, planning their office of tomorrow.

If you are numbered among those refractionists who are making post-war office plans, then write today for the interesting and descriptive literature on various Bausch & Lomb ophthalmic instruments, which is available for the asking. You will find this material helpful in planning your program for the future.

Riggs Optical Company

Distributors of Bausch & Lomb Products

General Offices: Chicago, San Francisco; Branches in Western and Mid-Western Cities

AMERICAN JOURNAL OF OPHTHALMOLOGY

VOLUME 27 FEBRUARY, 1944 NUMBER 2

TARSOCONJUNCTIVAL SLIDING-GRAFT TECHNIQUES FOR EYELID RECONSTRUCTION*

H. SAUL SUGAR, MAJ. (MC), A.U.S.
Vancouver, Washington

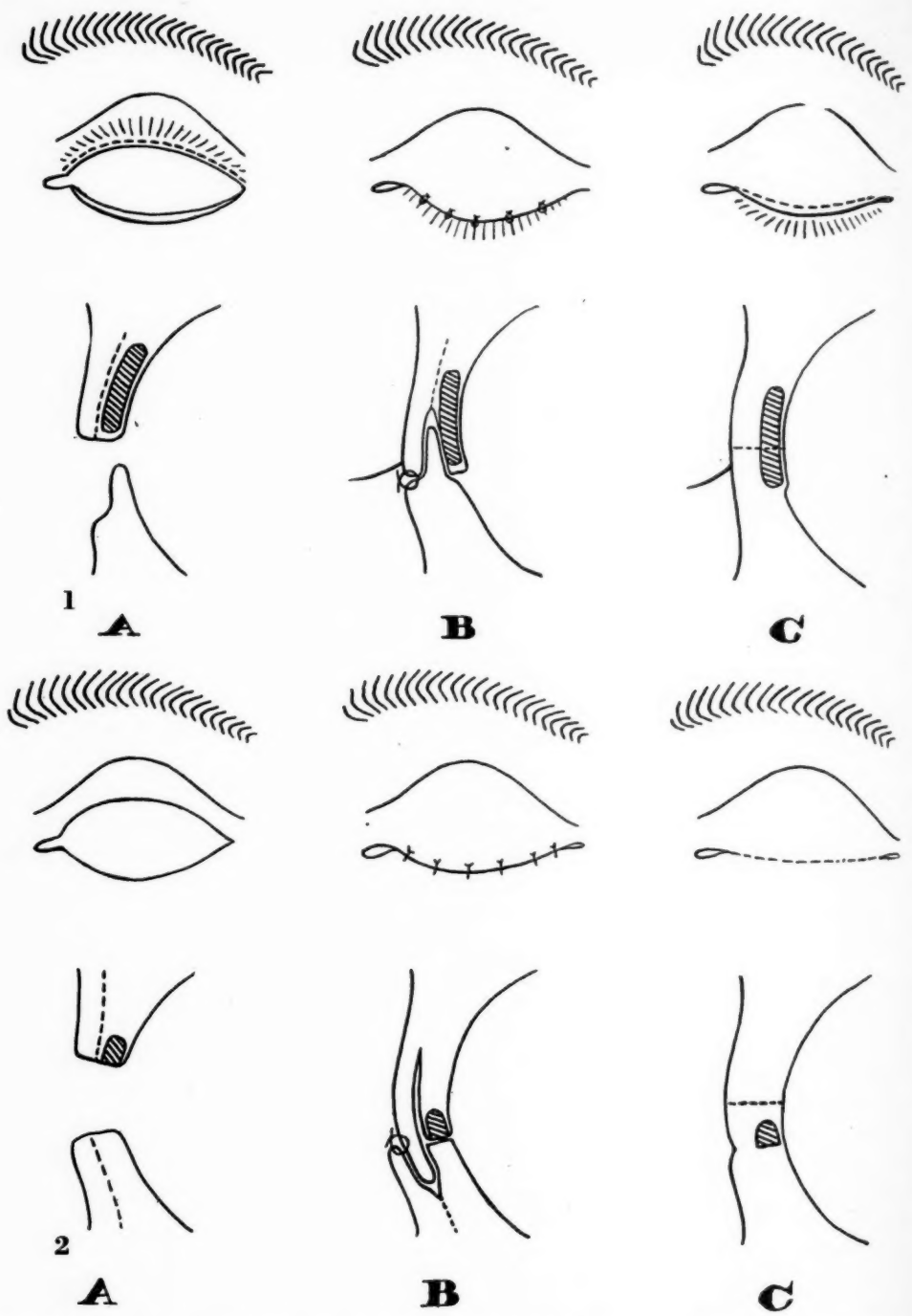
Since the introduction of Hughes's[1] method for reconstruction of the lower lid, it has been the most frequently employed method for defects involving the entire lower lid. In partial defects involving both skin and conjunctival surfaces, and under certain circumstances in complete defects, some of the other lid-splitting methods may, however, be more advantageous. These methods have therefore been assembled and briefly described. Included among them are the special techniques used in two types of cases by the author (figs. 8 and 11). These techniques may be of particular value in war injuries in which lid lesions frequently involve both skin and conjunctival surfaces.

The first lid-splitting technique for eyelid reconstruction was introduced by Landolt[2] in 1881. This method was used to obtain skin to cover defects in the lower lid in cases in which part of the conjunctiva remained. The upper lid was split into a tarsoconjunctival layer and a skin-orbicularis layer and the free borders freshened (fig. 1). The conjunctival layer remaining in the lower lid was inserted between the two layers of the upper lid, and the skin of the upper lid was sutured to the skin edge of the defect. Later the tissues were split to form two lids. Four years later Landolt[3] described a method (fig. 2) whereby lids were reconstructed in a case in which only half of the upper lid remained. The upper-lid remnant was split and the marginal cutaneous surface freed of epithelium. The edge of the lower lid remnant was split and the skin layer of the upper lid inserted between the two layers of the lower lid and sutured. Later the tissues were split to form two lids. No cilia were transplanted.

A second useful lid-splitting technique for partial lower-lid reconstruction was introduced by Köllner[4] in 1911. By this method (fig. 3), the upper lid is everted and an incision made through the conjunctiva and tarsus 2 mm. from, and parallel to, the lid margin, and sufficiently long to correspond to the defect in the lower lid. At both ends of the incision a vertical incision is made through the conjunctiva and tarsus, extending upward toward the fornix. This tarsoconjunctival flap is undermined, pulled down, and sutured in place in the lower-lid defect. The skin defect in the lower lid is filled with either a free or pedicle graft. Temporary lid-margin sutures are placed on either side of the defect area.

Kuhnt's automarginoplastic operation[5] is another procedure which may be extremely useful, particularly in cases of tumor of the lid-margin. The skin around the mass is incised in the form of an arch (fig. 4). On the conjunctival surface two incisions are made through con-

* From the Eye Clinic, Barnes General Hospital (U. S. Army).



Figs. 1 and 2 (Sugar). Landolt's method for repairing lid defects. Fig. 1. Repair of lower lid. A, outline of incisions; B, result of repair; C, lid-splitting stage.

Fig. 2. A, outline of incisions; B. result of repair; C. lid-splitting stage.

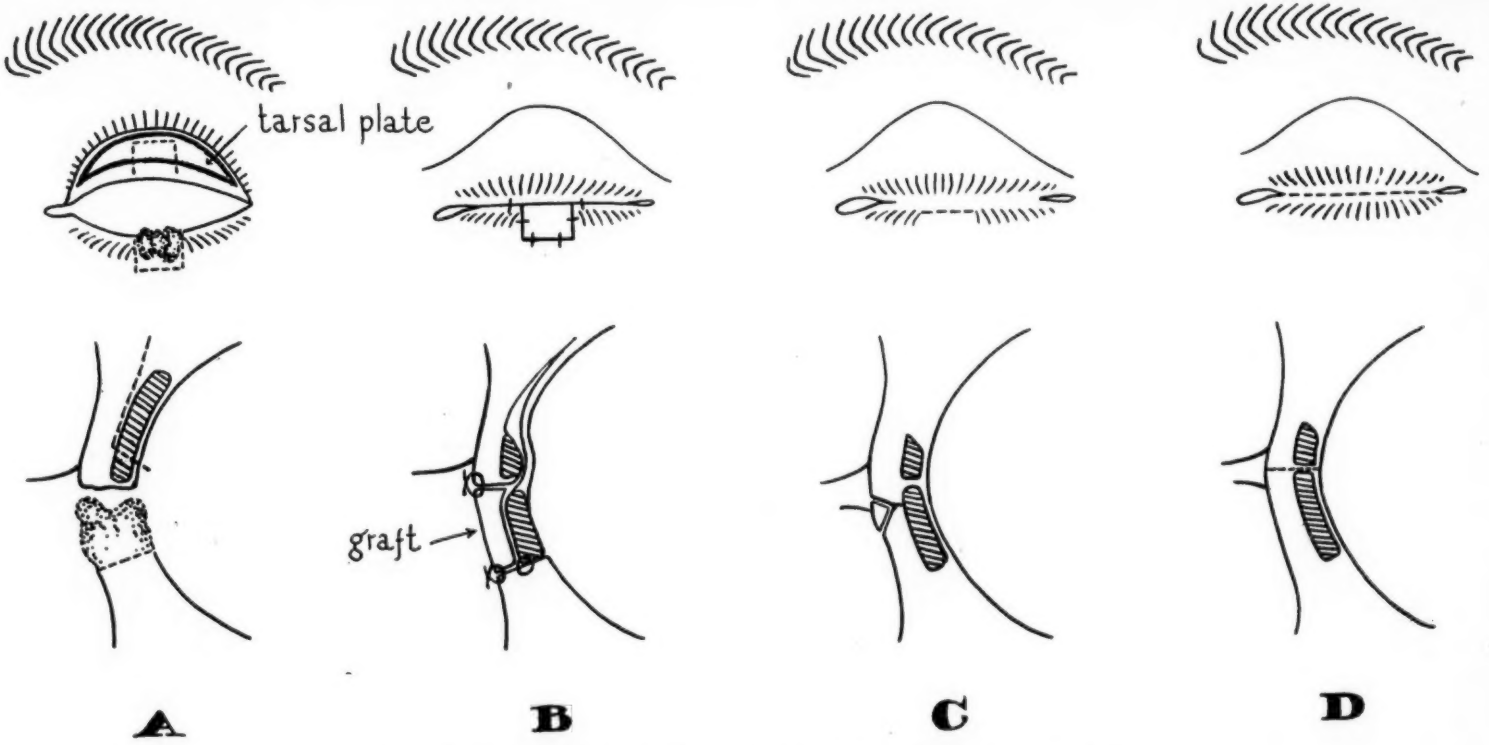


Fig. 3 (Sugar). Köllner's method. A, outline of incisions; B, result of repair; C, hair-bearing graft implant; D, lid-separation stage.

junctiva and tarsus perpendicular to the lid margin, beginning at the margin of the lid and extending in the conjunctiva to 1 cm. beyond the tarsus. Another incision is made parallel to the lid margin beyond the growth. The conjunctivo-tarsal flap thus prepared is brought toward the lid margin to fill the gap. The skin border is brought up and sutured temporarily rim. This strip of tarsoconjunctiva is split into two flaps at a point which will permit the one on the side of the defect to approximate the conjunctival defect in the upper lid. This is rotated into position in the upper-lid defect and sutured to the upper-lid tarsoconjunctival flap. The remaining tarsoconjunctival flap of the lower lid is stretched to fill the tarso-

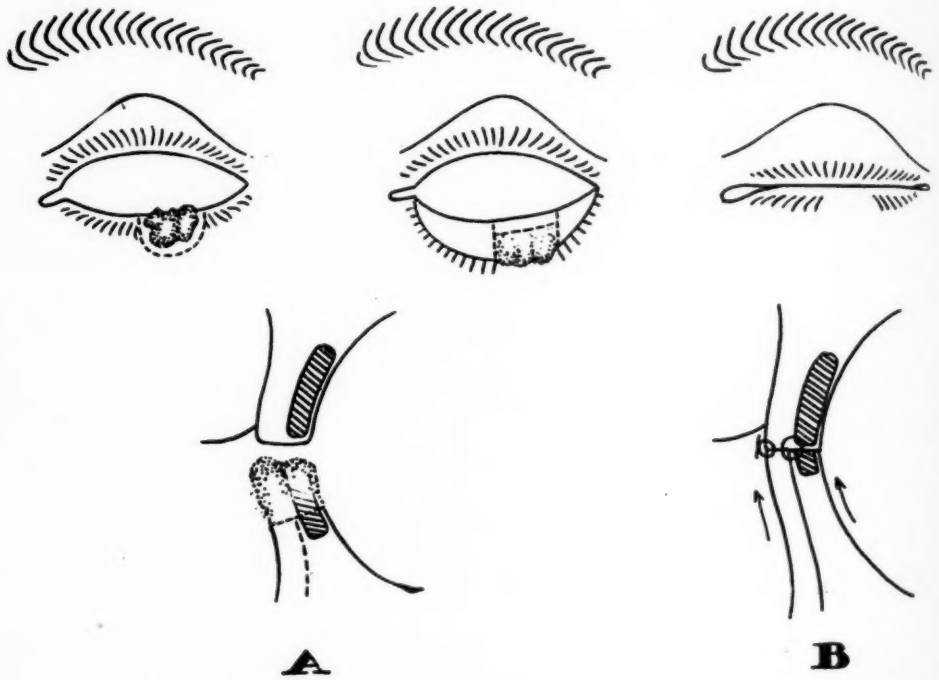


Fig. 4 (Sugar). Kuhnt's automarginoplastic operation. A, skin and tarsoconjunctival incisions; B, result of the repair.

to the upper-lid margin to fill the skin portion of the defect.

For partial defects of the upper lid Smith[6] described the following procedure (fig. 5): An incision is made, splitting the remaining portion of the upper lid and the intact lower lid. An incision parallel to the margin is made in the two layers of the upper-lid remnant at the level of the upper orbital rim. A similar incision is made in the tarsoconjunctival layer of the lower lid at the level of the lower orbital conjunctival defect in the lower lid, resulting from the rotation of the other tarsoconjunctival flap, and sutured into place. This leaves only the skin defect in the upper lid to be corrected. The skin flap formed from the upper-lid remnant is drawn over as far as possible and fixed to a flap made in the skin on the other side of the defect.

A fourth lid-splitting operation is that of Dupuy-Dutemps,[7] described in 1927. It may be used for either partial or total

loss of the lower lid and in partial loss of the upper lid. In the first stage of this operation, if done for correction of a lower-lid defect, an incision, slightly longer than the defect to be filled, is made in the intermarginal line of the upper lid (fig. 6). The skin-orbicularis layer is separated from the tarsoconjunctival layer. The latter is sutured to the conjunctival edge of the lower-lid stump. The skin-muscle layer is drawn downward and sutured to the skin borders of the lower-lid defect. After two weeks the second stage is done: The skin is incised just beneath the ciliary border and dissected upward so that the skin-muscle layer resumes its normal position, leaving the tarsoconjunctival layer in its new position. The skin defect is covered with a graft. Later, in two to four weeks, the palpebral opening is reëstablished by a through-and-through incision along the ciliary border.

The Hughes[1] operation for lower-lid reconstruction was described in 1937. By this method (fig. 7), the upper lid is split along the intermarginal line to about 3 mm. above the upper tarsal border. The skin of the cheek is undermined. The epithelium at the free border of the tarsoconjunctival layer of the upper lid is removed and the edge sutured to the conjunctival margin remaining in the lower fornix. The knots are left on the conjunctival surface. The skin of the cheek is drawn upward and attached to the anterior surface of the lower half of the tarsus. The skin-orbicularis layer of the upper lid is sutured to the anterior surface of the upper half of the tarsus. A

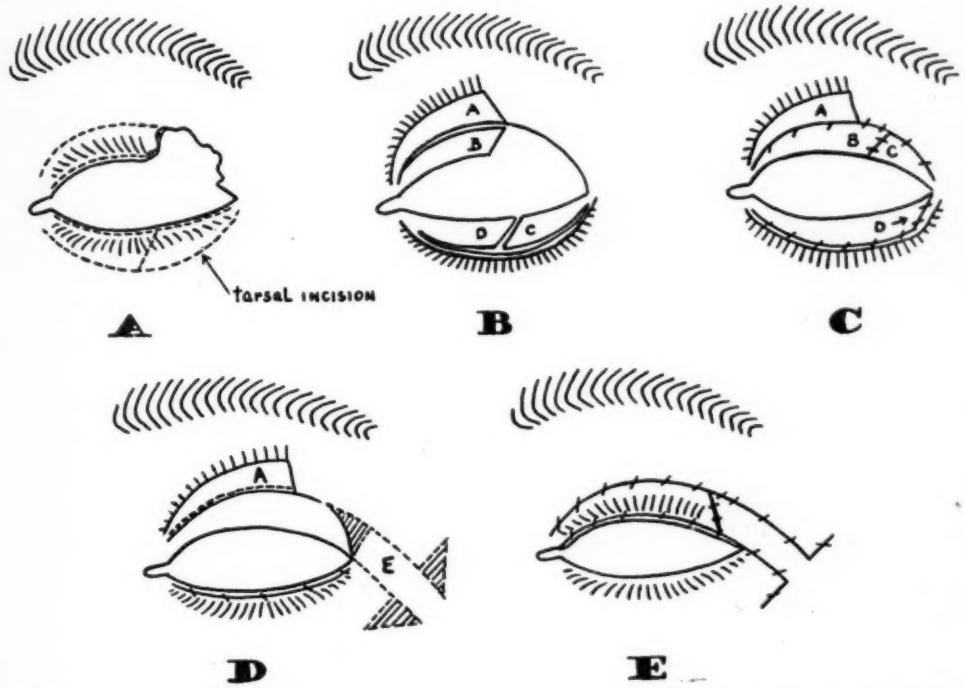


Fig. 5 (Sugar). Method described by Ferris Smith. A, outline of incisions; B, skin and tarsoconjunctival flap; C, rotation and suture of the flap C to edge of flap B—flap D is pulled over and sutured to fill the defect resulting from rotation of flap C; D, sliding flap E is formed to meet sliding flap A; E, the result of the surface repair. (After Smith.)

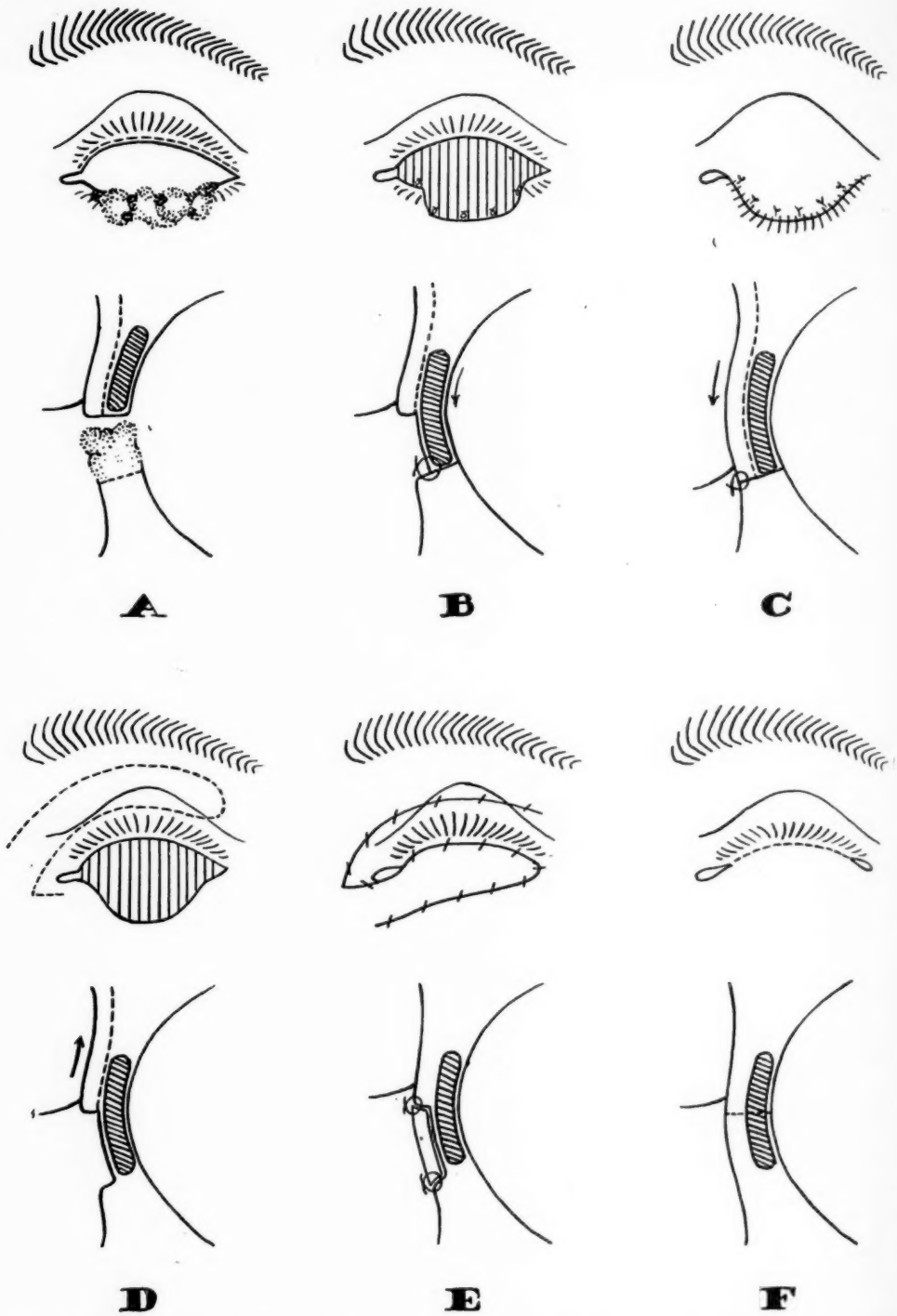


Fig. 6 (Sugar). Dupuy-Dutemps method. A, outline of incisions; B, tarsoconjunctival layer sutured to conjunctival edge of defect; C, skin layer sutured to edge of skin defect; D, skin layer returned to normal position in second-stage procedure; E, rotation of graft from upper lid to fill skin defect; F, lid-separation stage.

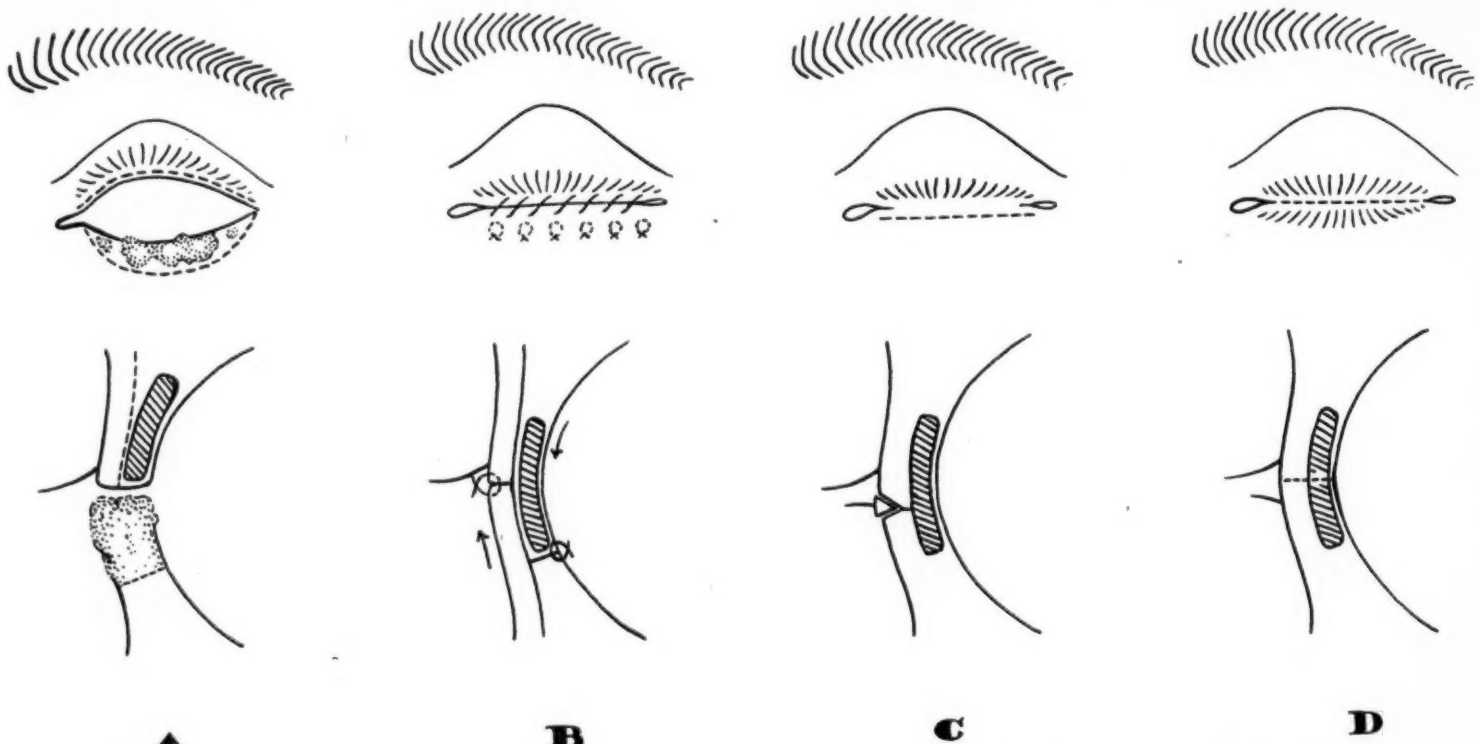


Fig. 7 (Sugar). Hughes's method. A, outline of incisions; B, result of repair; C, hair-bearing-graft implant; D, lid-separation stage.

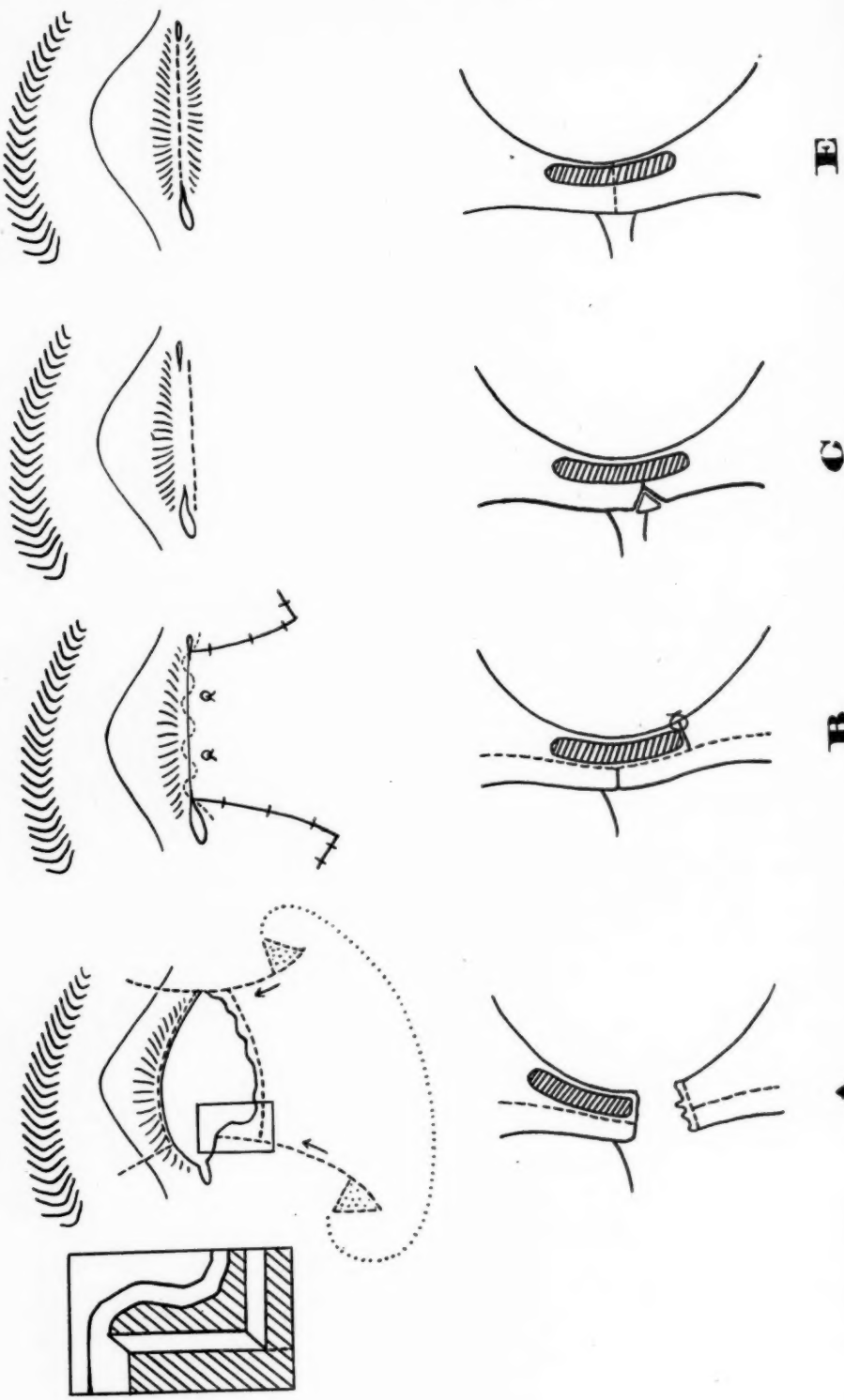


Fig. 8 (Sugar). Author's case 1. A, outline of incisions; B, result of surface repair, first stage; C, hair-bearing-graft implant; D, lid-separation stage.

subcuticular stitch is used to unite the two skin edges. At the end of six weeks a strip of hair-bearing skin is transplanted from the opposite brow to form the lower lashes, according to the method of Wheeler.[8] After another seven weeks an incision is made transversely between the two rows of lashes to form the interpalpebral fissure.

Gifford[9] has pointed out the need for leaving openings at both the inner and the outer canthi for drainage, instead of a single opening as in Hughes's procedure. He also considered the intermarginal subcuticular suture unnecessary.

Another lid-splitting operation somewhat similar to those of Dupuy-Dutemps and Hughes is that apparently used by Imre and Blaskovics and mentioned briefly by Saint Martin.[10] According to this method the upper lid is split and the skin of the cheek and lower-lid remnant undermined. Imre's sliding flaps are formed by curved incisions as indicated in each individual case. Burow's cutaneous triangles are removed at the ends of these incisions as necessary. Such a procedure was used by the author in cases of partial loss of the lower lid resulting from a war injury, with very satisfactory results (figs. 8, 9).

Case histories

Case 1. Lt. V. F. P., aged 28 years, was injured by enemy gun fire June 4, 1942, when the plane in which he was the bombardier attacked a Japanese ship off Umnak, Alaska. An enemy shell exploded in the nose of the plane. A secondary missile lacerated the patient's left eye and left lower eyelid. Lacerations of the skin of the nose, left angle of the mouth, and the left forearm were also incurred. On the following day an enucleation of the remnants of the left eye was done. The fragments of the lower lid that were present were sutured into position, although some of them were in such condition as to make their viability questionable. On June 12, 1942, the patient was evacuated to Barnes General Hospital. The sutured lid remnants had sloughed out and some deformity of the external canthus was present. The lateral two thirds of the lower lid were absent to the lower fornix. Because of a desire to preserve the lacrimal punctum and the normal lid remnant the following procedure was done on June 18, 1942: The skin of the left cheek was incised and undermined as shown in figure 8. A

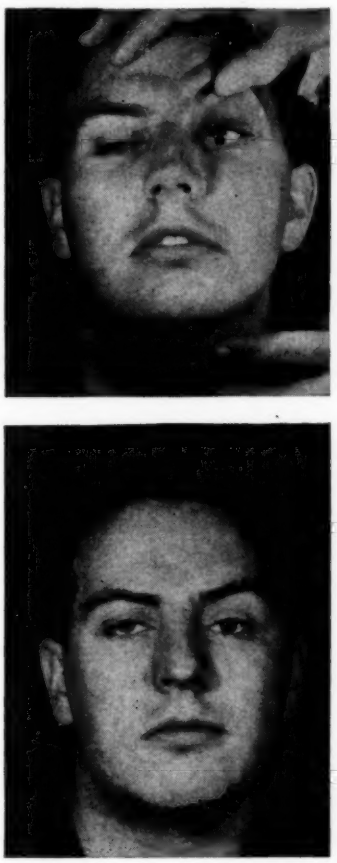


Fig. 9 (Sugar). Appearance of patient (case 1) before and after surgery. A prosthesis was inserted before photographing.

Burow's triangle was removed at the end of each lateral curved incision. The more nasal skin incision was made nasal to the edge of the tarsal remnant so as to give the effect of Wheeler's "halving" operation. The upper lid was then split into a tarsoconjunctival and a skin-orbicularis layer, beginning at the intermarginal line and extending to about 4 mm. above the upper tarsal border. The tarsus was incised vertically at the external canthus and at the junction of the inner and middle thirds to fill the defect in the lower lid. A prosthesis was inserted to give the lids form. The free edge of the tarsal layer was denuded of epithelium and sutured to the conjunctiva of the lower fornix, leaving the knots on the conjunctival side. The skin of the cheek was brought up and sutured with three vertical silk sutures to the lower half of the tarsus. A subcuticular suture was placed beween the two cutaneous edges. A thin rubber drain was inserted at the inner canthus and at the lacerated outer canthus. The cilia were held up with collodion. A pressure dressing was applied. On the sixth postoperative day the dressing and sutures were removed. A small epithelial defect in the upper outer corner of the graft was present. Two attempts to place a small free partial-thickness skin graft over the area were unsuccessful because of the constant secretion from the opening at the outer canthus. The defect healed well of its own accord, however. On August 2, 1942, a horizontal incision was made just below the intermarginal adhesion, extending down to the tarsus. A wedge-shaped hair-bearing graft 1½ mm. wide at the skin surface was removed from the right brow. This was turned end for end and inserted into the trough in the left lower lid and sutured into place. The brow incision was closed with interrupted sutures. A pressure bandage was applied to the left lids. On September 15th, a through-and-through incision was made at the lower border of the left upper lid. The prosthesis was removed. The conjunctival sutures and granulation tissue were removed, the prosthesis reinserted, and a dressing applied. Healing was uneventful.

Case 2. Lt. R. K. U., aged 23 years, received multiple shrapnel wounds from 20-mm. cannon fire on September 11, 1943, while serving as co-pilot on a bombing mission over Paramushiro. One fragment, 2 by 0.5 by 1 cm. in size, passed through the right eyeball and entered the right posterior inferior ethmoid sinus. The lateral third of the right lower lid was excised by a piece of plexiglass from the windshield. The eye was eviscerated on September 13, 1943. On October 26, 1943, the patient was admitted to Barnes General Hospital. The conjunctiva was continuous with the skin where the lateral third of the right lower lid was missing. The conjunctiva was clean but considerably shortened. On November 1, 1943, the lateral third of the upper lid was split, and the tarsoconjunctival layer sutured to the freshened conjunctival margin of the lower-lid defect exactly as was done in case 1. The skin of the cheek was incised and sutured to the lower half of the tarsus as in case 1. No prosthesis could be inserted as a mold. On the sixth postoperative day the dressing and sutures were removed. On November 22, 1943, a hair-bearing graft, 12 mm. in length, from the left brow was inserted into an incision in the new lower lid, as in case 1. Three weeks later the lids were split. Because of the lack of sufficient conjunctiva to permit insertion of a prosthesis, the temporal half of the conjunctiva was split on December 23, 1943, and undermined to permit insertion of a mold and a mucous-membrane graft from the lower lip. A mold of the same size and

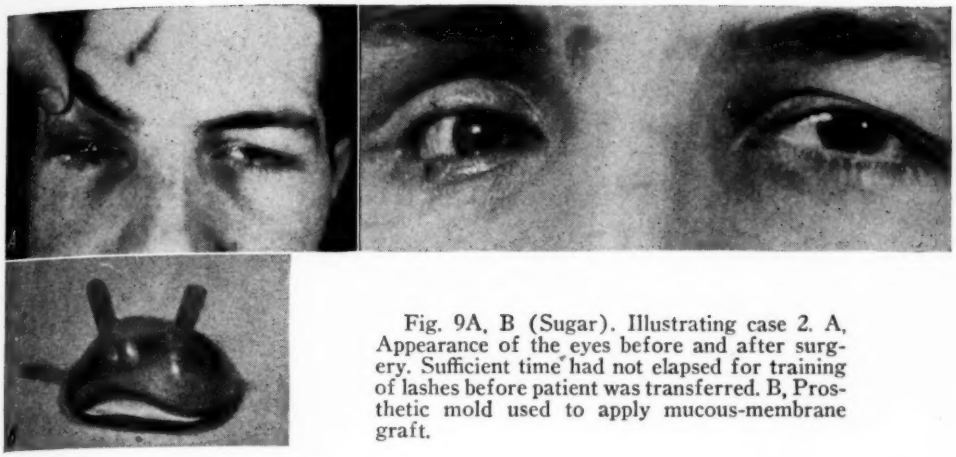


Fig. 9A, B (Sugar). Illustrating case 2. A, Appearance of the eyes before and after surgery. Sufficient time had not elapsed for training of lashes before patient was transferred. B, Prosthetic mold used to apply mucous-membrane graft.

shape as an artificial eye was made of transparent acrylic by Capt. E. V. Lambrechts of the Dental Department, according to the description by Penn and Brown,[11] except that, instead of perforating the mold with steel tubes to drain secretions accumulated behind the mold, perforated extensions continuous with the rest of the acrylic mold were used (fig. 9A, B). The mold was removed in five days, leaving a clean, well-grafted socket. A temporary artificial eye was introduced three days later preparatory to transferal of the patient to a center where a proper prosthesis could be made.

The procedure used in these cases embodies several important principles of lid reconstruction including: 1, lid-splitting; 2, the use of the Imre sliding flap with Burow's triangles; 3, the Wheeler hair-bearing-graft transplant to form lashes; and, 4, the Wheeler[12] principle of "halving" whereby the skin and tarsoconjunctival layers are united at different levels to minimize scar contraction.

As a result of the experience with these cases I am convinced that tying the sutures which unite the conjunctival layers on the conjunctival side introduces a source of irritation. It is possible in a case in which the globe is intact that a serious corneal ulceration may result. It might be wiser to place the sutures from the skin side and tie them after passing them through the undermined skin of the cheek at the proper level. Not only would they then permit earlier removal of the suture material but would serve instead of the vertical tarsus-skin sutures to hold the graft up to relieve tension.

A lid-splitting method for reconstruction of the upper lid for carcinoma was described by McLean[13] in 1941. By this method (fig. 10) two incisions are made through and through the normal tissue on each side of the growth perpendicular to the lid margin, and another parallel to the lid margin, delimiting the involved tissue. At each corner a Burow's cutaneous triangle is removed. The levator muscle is isolated and secured. The lower lid is split and the tarsoconjunctival layer attached to the conjunctival edge of the upper-lid defect after its edge has been freshened. An orbicularis strip from the upper lid is swung down over the transplanted tarsus. The skin above the defect is drawn down and sutured to the edge of the skin layer of the lower lid. Later a hair-bearing graft is inserted, according to Wheeler's method. As a final stage the lids are split.

For contiguous lesions of both lids

Fig. 10 (Sugar). McLean's method. A, outline of incisions; B, result of repair; C, hair-bearing-graft implant; D, lid-separation stage.

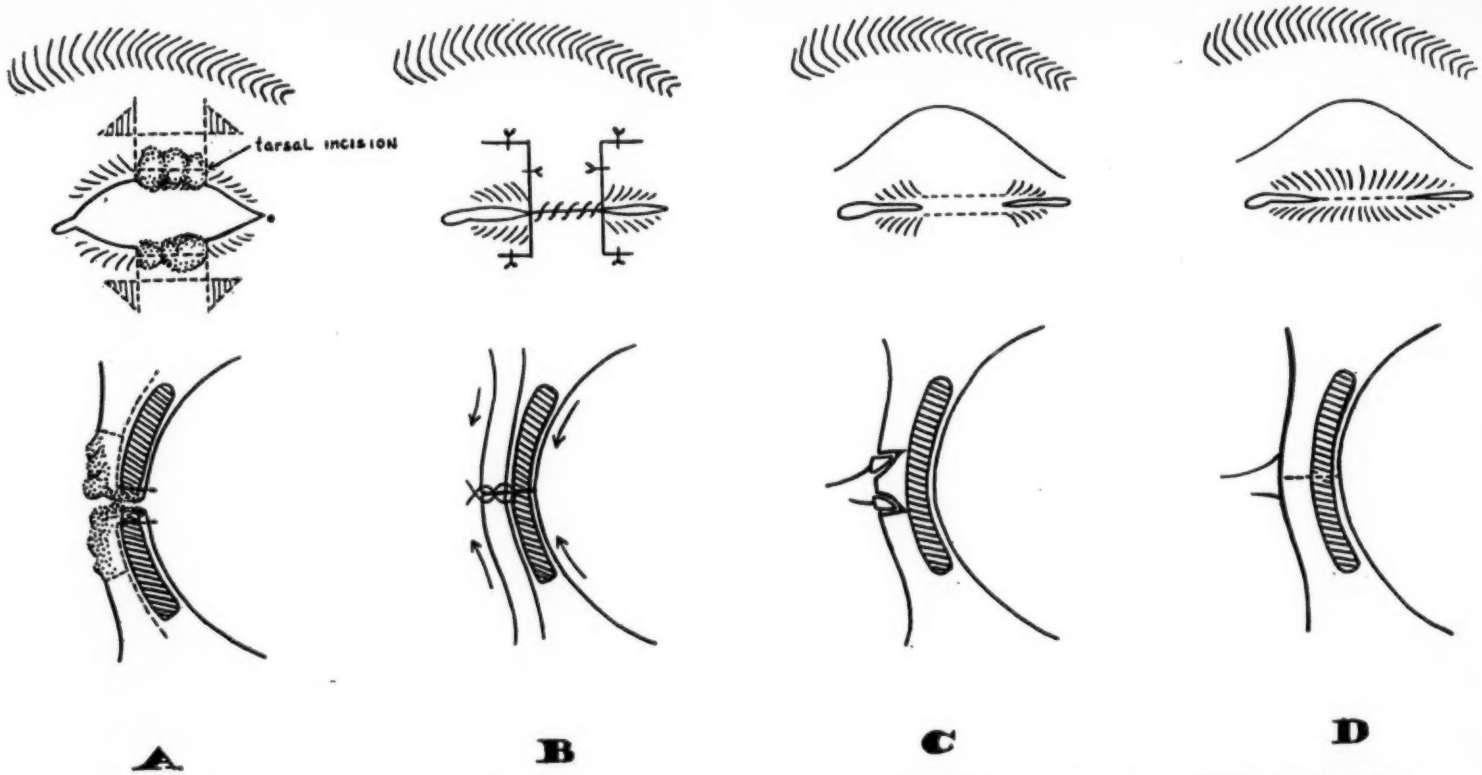


Fig. 11 (Sugar). Author's case 2. A, outline of incisions; B, result of repair; C, hair-bearing-graft implants; D, lid-separation stage.

I have used a method (fig. 11) described in the following case history:

Case 3. Pvt. R. O. B., aged 27 years, was admitted to Barnes General Hospital on April 8, 1943, because of inability completely to close his right eye owing to the presence of contiguous growths on the margins of both right lids. The upper mass had been present since birth, the lower was first noted at the age of 12 years; both had grown moderately in size. The upper mass measured 14 by 6 mm., whereas the lower measured 6 by 12 mm. in size. Both extended about 1½ mm. on the conjunctival surface. The pathologist's diagnosis was papillary pigmented intradermal nevi.

On April 13, 1943, the skin was incised as shown in figure 11, in the same manner as followed in making McLean's skin incisions except that only a small border of normal skin was included. Burow's triangles were removed from the four corners. The skin was undermined beyond the excised areas. The tumor masses were removed, leaving the tarsoconjunctival layer intact except for 1½ mm. at its free border on each lid. The tarsi were incised at the lateral margins of the defects without going through the conjunctiva so that the tarsal margins could be sutured together without leaving a gap between them. The sutures were brought out through the flap edges and tied. The skin edges were then united with interrupted sutures. The sutures were removed on the fifth postoperative day. On April 27, 1943, horizontal incisions were made just above and below the intermarginal adhesion, extending along the tarsus above and below. Thin hair-bearing grafts were removed from the left brow and sutured into place in the troughs. The brow incision was closed with interrupted sutures. The sutures were removed on May 1st, at which time collodion was used to direct the hairs into the proper position. On May 12, 1943, the lids were separated. Healing was uneventful.

This procedure was planned as a combination of the methods of Köllner and McLean. However, only a small amount of tarsus was found to be involved. In cases presenting more involvement of the tarsus, a through-and-through vertical incision of the tarsus and tarsal conjunctiva should be made on each side of the lesion in each lid, either continuous with the cutaneous incisions or slightly away from them so as to produce the effect of "halving." The incisions should extend for 4 mm. or more in the conjunctiva and a tarsoconjunctival or conjunctival flap formed by undermining. The conjunctival or tarsoconjunctival flaps from

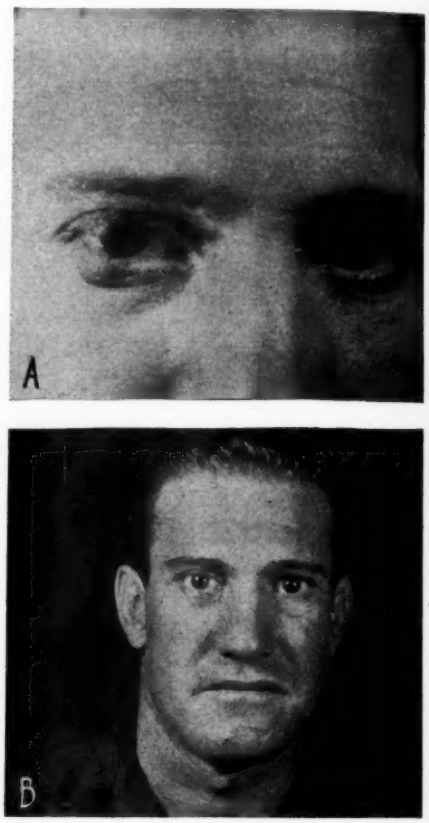


Fig. 12 (Sugar). Appearance of patient (case 3) before and after surgery.

the two lids should then be united by sutures that are continued through the cutaneous flap margins and through small pieces of rubber over which they are tied.

It will be noted that in both procedures used by the author the same four principles were considered and may be applied in any case where tarsoconjunctival sliding grafts are used. These are, in recapitulation: (1) splitting the lid into tarsoconjunctival and skin-muscle layers; (2) use of Imre sliding skin flaps with Burow's triangles, where indicated; (3) use of the Wheeler method for forming lashes; and (4) use of the Wheeler "halving" principle, where applicable. These principles may be applied in the repair of lid colobomas, traumatic defects, and the defects resulting from the removal of tumors.

Barnes General Hospital.

References

[1] Hughes, W. L. A new method for rebuilding a lower lid. Arch. of Ophth., 1937, v. 17, p. 1008.
[2] Landolt. Arch. d'Opht., 1881, v. 1, p. 9.
[3] ——. De quelques operations pratiquées sur les paupières. Arch. d'Opht., 1885, v. 5, p. 481.
[4] Köllner. Muenchener Med. Woch., 1911, v. 58, p. 2166.
[5] Meller, J. Ophthalmic surgery. Ed. 3, Philadelphia, P. Blakiston's Son & Co., 1923, p. 73.
Kuhnt. Zeit. f. Augenh., 1916, v. 36, p. 147.
[6] Smith, F. Manual of Standard practice of plastic and maxillofacial surgery, Philadelphia, W. B. Saunders Co., 1942, p. 199.
[7] Dupuy-Dutemps, L. Bull. Soc. franç. d'Opht., 1927, v. 40, p. 263.
[8] Wheeler, J. M. Plastic operations about the eye. Internat. Ophth. Cong., 1922, pp. 443-460.
[9] Gifford, S. R. The Hughes procedure for rebuilding a lower lid. Arch. of Ophth. 1939, v. 21, p. 447.
[10] Saint Martin, M. L'excision des cancers des paupières après la technique d'Imre. Bull. Soc. d'Opht. de Paris, 1937, v. 49, p. 36. Abstr. Zentralbl. f. d. ges. Ophth., 1937, v. 39, p. 389.
[11] Penn, J., and Brown, L. The rapid preparation of eyesockets. Surg., Gyn. Obst., 1943, v. 76, p. 204.
[12] Wheeler, J. M. Halving wounds in facial plastic surgery. Proc. 2d Cong. Pan-Pacific Surgical Assoc., 1936, pp. 228-229.
[13] McLean, J. M. Plastic reconstruction of the upper lid. Amer. Jour. Ophth., 1941, v. 24, p. 45.

THE DEVELOPMENT OF A SYSTEM OF INTRACAPSULAR CATARACT EXTRACTION

DANIEL B. KIRBY, M.D.
New York

In the descriptions of new procedures in intracapsular cataract surgery various authors have conveyed to the reader their particular techniques, but they have not given the variations and indications necessary to adapt the manipulations to the case in hand. They have not told what to do next, if a particular procedure fails to produce the desired result.

The present writer has made it a habit to examine patients and their eyes carefully, with all necessary devices, before operating and then to continue his observations before and after each maneuver during the operation. He has looked and has seen what he has accomplished before he has proceeded to the next maneuver. Manipulations have been varied according to indications as they presented.[1] Gradually there has been developed a system of intracapsular cataract extraction, which may be defined as an orderly array of thoughts on this particular subject. When once the decision has been made to remove the cataract in capsule, the surgeon has a better chance of success if he has formulated in his own mind the procedures which he will apply under certain conditions and if he is prepared to vary them if the conditions change.

One cannot anticipate by age, physical condition, nor local examination of the eye, even with the microscope, just how the operation will proceed. If all of the possible contingencies, emergencies, or complications[2] have been encountered in practice or in teaching, and are anticipated, then the unexpected becomes the expected and is no surprise. One may then assay the situation more calmly and proceed with a cold and scientific accuracy of thought and precision of application which leads the way out of disturbing situations and even out of complications that might be distressing.

The observations and procedures described in this paper have been developed in the course of private surgery, not with any idea of experimentation but because a previously or spontaneously developed idea seemed to fit a particular situation, was applied, and was then reapplied when a similar situation arose. Ward or clinic patients in the author's service were all operated upon by residents in their training in extracapsular or intracapsular surgery, as indicated in the particular case. No cases have been used for demonstration purposes.

THE BASIS OF THE SYSTEM

The exposition of the system of intracapsular cataract surgery in this paper will be chiefly concerned with the behavior of the lens capsule, cortex, nucleus, zonule, and vitreous. It is necessary to consider not only the cases with intact zonules in which there is apparently normal anatomic position of the lens and vitreous but also those in which there may be subluxation or luxation of the lens, either through congenital malformation, degeneration, or through trauma.

INTRACAPSULAR DELIVERY OF LUXATED AND SUBLUXATED LENSES

In all cases of subluxation or luxation the placement of efficient corneoscleral sutures prior to incision is indicated. In

congenital cases and in certain cases in which minor trauma caused luxation or subluxation of a cataract with a fragile zonule, the hyaloid may be intact and it may be possible to remove the lens without loss of vitreous; but in severe traumatic cases, the vitreous and the hyaloid are greatly disturbed and loss of vitreous is to be expected and prepared for. If the lens is completely free from its zonular attachments, the ligamentum hyaloidea capsulare may support the lens in position. In clinical surgery, in cases of cataract, there is little evidence that the ligamentum hyaloidea capsulare is any more than anatomic coaptation, except in rather rare pathologic instances where the hyaloid seems to be adherent to the posterior lens capsule. It is possible that in the normal eye there is a slight degree of cohesion and that this property is diminished when the ligament degenerates with the development of cataract.

Luxation of the lens into the anterior chamber. Differentiation of this condition in certain instances must be made from hematogenous staining of the cornea. Removal of the luxated lens in capsule from the anterior chamber is definitely indicated because if increased intraocular pressure has not already developed it will undoubtedly ensue. If the intraocular pressure is not elevated, a small peripheral incision, avoiding injury to the lens capsule, may be made with the knife and then enlarged with scissors. The lens may escape as soon as the incision is large enough or it may be withdrawn by traction with suitable forceps, suction cup, or with a loop.

Increased intraocular pressure in cases of luxated lenses. If the intraocular pressure is increased, the opening of the anterior segment is hazardous because of the crowding forward of various structures, and the danger of hemorrhage and of iris and vitreous prolapse. The writer has not made use of his plan as yet to lower the intraocular pressure, in cases of subluxated or luxated lenses, by drainage of the vitreous. He would do this, not by posterior scleral puncture with a knife but by a method which has worked well as a preliminary to an anterior operation in certain cases of glaucoma. After exposure of the sclera in the inferior temporal quadrant by conjunctival and Tenon's-capsule dissections, the sclera in an area 10 to 12 mm. posterior to the limbus is trephined to the choroid. The latter naturally bulges into the opening. Electro-coagulating current of intensity similar to that used in the operation for reattachment of the retina is used to pierce the choroid, then the retina, then the internal limiting membrane or hyaloid, whereupon the vitreous is permitted to escape slowly. The relations of the structures in the anterior segment then may appear more normal. Even though the initial limbus incision may be difficult in a decompressed eye, it seems to the author that this may prove to be a better way out of the emergency than a primary anterior drainage. This procedure is recorded here as an untried example of the preparation for an emergency in the development of the system of intracapsular cataract surgery. It is not recommended and it may be necessary to discard it, but it is nevertheless recorded for the sake of completeness.

Luxation of the lens with retention of its position in the patellar fossa. It is possible, although not probable, that the lens may remain in the patellar fossa even though completely free from the zonular attachments. The hyaloid must necessarily be intact for this condition. The lens may be removed by traction alone, with

the forceps, suction cup, or with the loop.

Luxation of the lens into the vitreous. This condition may develop as a result of malformation or degeneration of zonule and vitreous or because of trauma either accidental or during the process of cataract surgery. Except in the last-named instance, the position, movement, or fixation of the luxated lens should first be carefully studied with the ophthalmoscope and particularly with the aid of the phenomenon of fluorescence of the lens by suitable devices.

If the lens will come forward when the patient lies face down, it may settle into the anterior chamber through the dilated pupil and then be imprisoned by the action of miotics, later to be removed through an anterior incision. If one does not succeed in moving the lens in this manner, the procedure will then depend upon the question of whether the vitreous is abnormally fluid or normally viscid.

Luxation into fluid vitreous. If abnormally fluid, the seepage of fluid vitreous directly after the incision, with lowering of intravitreous pressure to that of the atmosphere, is expected. The procedure described by Verhoeff,[3] of floating a lens that is not adherent up to the anterior region of the eye, where it may be picked up by forceps or by loop and removed, should be tried. If the lens is adherent to the internal limiting membrane or to a false membrane on the retina, the prognosis for removal and restoration of function is poor.

Luxation into viscid vitreous. If the lens is luxated into viscid vitreous, there seems to be no option but to use the loop. The application of forceps or suction tip to lens capsule through intervening vitreous is out of the question.

Toilet of the incision after loss of vitreous. A complete, wide iridectomy should have been made in preparation for loss of viscid vitreous, in cases of traumatic luxation of the lens, so that when the preplaced corneoscleral sutures are tied to close the incision effectively, there will be no iris incarceration. It is difficult to replace the iris pillars when viscid vitreous is in the incision. A miotic may be used to help keep the iris from becoming incarcerated. Any vitreous that protrudes should be cut off flush with the incision. Careful and unhurried closure of the incision will help in the healing of such eyes.

Subluxation of the lens. This may develop through congenital malformation, degeneration, or through trauma.

Congenital malformation with subluxation of the lens. The zonule may be incompletely formed and may be the cause of unilateral or bilateral, usually symmetrical, subluxation of the lens. The lens is small and spherical or nearly so. The hyaloid is usually intact and the vitreous self-contained, although this may not be true. If the vitreous and hyaloid are intact, an attempt should be made to remove the lens without loss of vitreous. This may be accomplished as in the experience of the author in the case of a woman, aged 52 years, who had an upward subluxation of the lens in the right eye. Preplaced appositional sutures of the McLean[6] type were inserted. A preliminary iridectomy had been made by another surgeon. The author's plans in a similar case would be to perform only a peripheral iridotomy. Incision was made in the usual upper segment of the corneal limbus. The central suture was used to retract the corneal flap, giving a direct view of the lens capsule and permitting the blades of the intracapsular lens-cap-

sule forceps to be placed ever so lightly upon the capsule, to be closed, picking up a portion of the capsule, to draw the lens down so that the zonule was exposed. This permitted it to be stripped off the capsule with the aid of the rounded elbow of the author's lens-expressor hook. The lens was thus delivered without presentation or prolapse of vitreous. The sutures were tied. There was no incarceration of iris tissue, so that it was not necessary to use the iris repositor. A miotic was instilled. The final healing and result were satisfactory. The usual procedure in cases similar to that just described is to attempt to remove the lens with the loop.

The zonule of the young is resistant and elastic. Observations have been made in such cases in young individuals who have very elastic zonules which resisted several attempts to withdraw the lens, the latter eluding the loop when nearly out of the eye and springing back to its original position as if drawn there by a very live elastic band. It is not known whether such a zonule may be stripped off by the dull elbow of the lens-expressor hook. If not, a sharper zonulotome, such as an iris spatula, may be in readiness to divide such a zonule rather than permit the lens to escape from the loop. The repetition of the ineffective maneuver of traction alone in such a case is to be avoided.

Subluxation of the lens through trauma or degeneration associated with cataract formation. Careful examination should be made to determine, if possible, the portion of the zonule that is still intact and attached to the lens before the section is made. If this can be discovered, the incision may be placed so that the loop may be passed through the open area and not through the intact portion of the zonule; thus the danger of completely luxating the lens into the vitreous is avoided. In many instances the intact area is not apparent, and is discovered only after the section has been made. The expected loss of vitreous is to be anticipated with preplaced sutures and by iridectomy. Trauma that will subluxate the normal lens will surely disturb the vitreous greatly. If the intraocular pressure is increased, recourse may be had to posterior draining before the anterior incision is made, as described previously.

If the intact zonule is in the inferior position, the lens will tend to swing backward on the zonular hinge. It may be brought forward by the loop, which is passed behind it from above. If the intact zonule is on one side or the other, the loop may be rotated over the opposite equator of the lens to get behind the lens and bring it forward. If the intact zonule is above, a variation of the incision from the straight horizontal to one or the other oblique may be made. Then the loop may be passed and rotated over the equator of the lens. If the straight horizontal incision has already been made, it may be possible to use the loop in a similar manner or to clear the vitreous from the upper face of the anterior equatorial region and apply the suction cup, using no pressure. These manipulations have all been employed by the author. No one can be satisfied with the appearance of an eye after it has been subjected to a wide iridectomy and the apparent necessary and expected loss and incarceration of vitreous, in traumatic cases. The patient, however, may be considered fortunate to preserve any visual function at all after such severe injuries.

In cases of degeneration of the zonule with minor trauma, conditions may be such that vitreous loss need not be experienced in the removal of subluxated lenses.

Intracapsular cataract extraction in eyes with intact zonules

The indications for intracapsular cataract extraction have been discussed frequently. The writer does not consider that there is any hard and fast rule in the matter. In general, unless there is a special sensitivity to the substance of the cataract, cases of mature senile cortical and of dense nuclear sclerosis may do as well with extracapsular as with intracapsular extraction, although the number of operations required to achieve the final visual result will be greater in the extracapsular group because of the discissions required should aftercataract develop. In cases of intumescent cataract in which the capsule is taut, and resists the application of the forceps, intracapsular extraction may be performed with pressure or traction alone, with a suction cup if the zonule is fragile; but if not, it is better that the capsule be opened and the extracapsular procedure employed or the cataract be permitted to progress to maturity and the choice of procedure deferred until then. The intracapsular procedure is the method of choice in cases of luxated and subluxated cataract; in hypermature cataract, either of the shrunken or Morgagnian type; in cataract complicating glaucoma either primary or secondary to inflammation, in cases of exfoliation of the lens capsule, uveitis, and retinitis pigmentosa. When the intraocular pressure is low, the intracapsular procedure may be used if the zonule is fragile, otherwise the extracapsular operation should be employed. If the decision has been made to remove the lens in capsule this should not be regarded as final and permitting no deviation because a mishap may turn the procedure into an extracapsular one should a tear in the capsule supervene. The surgeon may also decide after an effort that the risk is too great and change over to the extracapsular procedure. However, any surgeon who elects to start an intracapsular extraction should be prepared to carry it through confidently to a successful conclusion with a minimum of trauma and complications and certainly without inflicting any greater trauma on the eye or causing any greater complications on the average than would be incurred if the extracapsular procedure were routinely used. Results speak for themselves and while surgeons like Weeks, Wheeler, and others have had most enviable records and a long history of success with the extracapsular operation, immediate and long-continued, beautiful results are obtained with the intracapsular method. The writer was trained in the extracapsular procedure and had 10 years of experience with it. Now he has had 10 years of experience with the intracapsular procedure. Because of the relatively infrequent inflammatory reaction, the low incidence of secondary rise of intraocular pressure and other complications, and the large percentage of cases in which it can be applied with as reasonable an expectation of success as the extracapsular, he has permanently adopted the intracapsular procedure, to be used when indicated.

The iris. The successful intracapsular extraction together with a completely mobile, round pupil offers the ideal result. The choice of the round pupil may be made in any case in which the pupil will dilate to 6 mm. or more. It may be made if the pupil dilates only to 5 mm., should the cataract be small. In case the iris is rigid and the pupil will not open to more than a diameter of 4 mm., a complete coloboma is necessary. In difficult cases and when it is impossible to get a peripheral grasp of the lens capsule at or near the equator, the coloboma of the com-

plete iridectomy facilitates the operation. A miotic is used after the successful intracapsular operation.

The zonule. The writer has found by clinical surgical experience that about 15 percent of the zonules are fragile, 70 percent have average resistance, and the balance have above the average resistance and resiliency.

There is no age group into which these three classes fall. One might expect resistant zonules in the younger group of cataract patients, and the weakest zonules in those over 60 years of age, but the conditions found do not permit such a classification—they undoubtedly vary in racial units. The early deterioration observed in certain of the Asiatic groups provided more fragile zonules than those found in the Caucasian groups. The normal healthy human zonule is undoubtedly very resistant and resilient. There is probably always some degree of degeneration of the zonule in every case of cataract.

Methods and Procedures

A brief review of the history and of the methods and procedures devised by various surgeons was given in a previous article.[1] The author has developed a method of using pressure before the application of traction and rotation of the lens. He has used it with success in cases in which the zonule ruptures easily on slight pressure, and in those cases in which an average amount of pressure, traction, and rotation is necessary to cause rupture of the zonule and provide for delivery of the cataract. The preliminary pressure that is used to subluxate the cataractous lens is applied with the point of a hook (preferably not a heavy or blunt point but a flattened point, such as is found on the Jamison muscle hook). Point pressure (approximately 2.5 mm. by 0.5 mm.) is preferred to pressure with a ring or with the side of a lens spoon; for the point reaches down to the space between the corneal ring and the equator of the lens, whereas the broader instruments do not do so. The author has devised an intracapsular lens expressor, using the Jamison hook tip on his own 5-mm.-diameter light-weight cylindrical handle. The pressure is applied just inside the clear periphery of the cornea, the ring of the limbus being easily and distinctly felt. The principle involved in the confinement of pressure to this inside circumference of the cornea lies in the applied anatomic fact that the lens diameter (approximately 10 mm.) is less than that of the transparent cornea (approximately 11.5 to 12 mm.) and, therefore, the zonule attached to the equator of the lens is just inside the corneal periphery. The flattened point of the hook, as described, may be insinuated between the lens equator and corneal periphery, reaching the zonule through the thickness of cornea and iris. The point first pressed upon is at the 6-o'clock position on the corneal dial; next, another point is pressed upon at 8 o'clock, and then at 4 o'clock, a slight stripping movement being used, designed to slide down over the convexity of the inferior equator of the lens and release the zonular fibers from their attachment at the equator. The manipulations may be repeated once and possibly twice to achieve the result. As an alternate to point pressure, circumferential pressure in curvilinear fashion inside the ring of the limbus of the cornea may be applied, gradually covering almost all the lower semicircle of the limbus. The degree of pressure and indentation of the cornea varies in the individual case. In general, however, the pressure may be described as rather sudden and sharp, indenting the cornea 2 to 3 mm. but within the limits of what may

be regarded as safe. Indications of yielding and of rupture of the zonule and the movement of the lens, its tilting, and presentation when subluxated, must be learned by experience. It may be said that when the zonule has ruptured there is less resistance, and the body of the lens rises. It is never necessary, in an attempt to remove a cataract in capsule, to apply pressure over the white portion of the sclera, thus traumatizing the ciliary body and disturbing the vitreous body. The reasons for taking the preliminary steps of rupturing the zonule below before applying the forceps are (1) that greater ease is experienced in picking up the capsule that has been relaxed by rupture of a portion of the zonule; (2) that a shorter period of time is required for the delivery of the lens after the forceps have been applied. It is believed likewise that the preliminary pressure is also sufficient to sever the light union, cohesion, or close coaptation that exists at the ligamentum hyaloidea capsulare between the lens and the vitreous without any injury to the latter.

Contraindication to the use of pressure. The initial pressure is not used when there are indications of increased intravitreous pressure as evidenced by gaping of the wound, creasing of the incision from puncture to counterpuncture, or repeated prolapse of the iris that resists reposition.

Delivery of cataracts with fragile zonules. The initial pressure applied before any traction is used may accomplish the subluxation of the cataract by the rupture of the inferior zonule. In the experience of the writer it is a fact that it does so in about 15 percent of the cases. Within safe limits it does not do more, else the method of extraction by pressure alone might be more useful. The writer, in the cases in which subluxation was evident by the rising and movement of the lens, and by the appearance of a dark crescent below the cataract, has not delivered the lens by pressure alone, although this is possible, but has preferred to do so with the aid of traction.

The manipulation of initial pressure is worthwhile. The initial-pressure procedure is worthwhile even in the cases in which subluxation does not occur as a result of this maneuver alone, for it aids in the making of observations that give an index of tissue resistance or lack of tissue resistance; the thickness of the cornea and of the iris; of intraocular pressure; of the resistance of the vitreous; of the support of the lens; of the size of the lens and particularly of the nucleus; of the hardness or softness of the lens; and, in general, of the suitability of the eye to be subjected to the manipulations involved in intracapsular cataract extraction. It is a worthwhile, conservative, useful procedure that does not add to the risk of the operation.

The elevation of the corneal flap and the application of the forceps. Three directly appositional radial sutures are inserted in the corneoscleral tissue after the incision. The writer has described elsewhere[4] the central suture that is used to retract or elevate the corneal flap in order to obtain a direct view of the iris and of the anterior lens capsule. This maneuver permits the surgeon to observe the efficacy of the size of his incision in relation to the bulk of the lens—if the incision is not large enough it may be increased before the extraction is started. Following Verhoeff's[5] lead, the upper portion of the capsule has been chosen as the most desirable site for the application of the intracapsular forceps, for it is at this point that they can be ap-

plied to the capsule ever so lightly with the least backward pressure, the capsule being in direct view when the corneal flap is lifted. The grasp at or near the upper equator permits of the manipulations to be described later. It seems preferable, to the writer, not to apply the forceps below: first, because of the curvature of the inferior portion of the lens sloping away from the surgeon's grasp; second, because the capsule and the grasp of the forceps cannot be seen clearly through the hazy collapsed cornea; third, in practice an undesirable backward pressure (be it ever so slight) on the lens must be made in order to pick up the capsule; and, lastly, because certain manipulations are not possible with this lower grasp. If a complete iridectomy has been performed, the forceps may be applied to the anterior face of the equatorial region of the lens capsule in practically the same manner as is done by Verhoeff, and the nucleus tilted by gently pressing on the lower equator with the point of the hook just within the limbus. The grasp of the forceps straddles the new equator of the tilted nucleus. If there is no coloboma, the blades of the forceps held in the left hand are slid beneath the iris, to take hold of the anterior face of the equatorial region of the lens capsule at about 10 or 11 o'clock on the lens dial, or the iris may be retracted and a grasp made at 12 o'clock. When a proper hold of the capsule involving a 4- or 5-mm. area has been secured, as may be known because of the direct view of the area, the traction of the central suture on the corneal flap may be released. The turning of the corneal flap by traction suture does not lead to striped keratitis, loss of vitreous, bullous keratitis, corneal opacity, interference with healing, or other undesirable sequelae. The writer has recently raised the flap after the extraction of the cataract, not routinely but in many cases, to observe the vitreous and the position of the iris. If the latter is not lying between the edges of the incision the use of the repositor is avoided, thus reducing manipulation and trauma to the iris.

The writer's method of making pressure, traction, and rotation

The forceps having been applied to the lens capsule above, they are lifted slightly vertically and drawn toward the surgeon. One may quickly determine whether the inferior zonule has been ruptured by the initial or preliminary pressure or whether the zonule is still intact. If it has been ruptured, the cataract may be delivered quickly and easily with a slight degree of traction and pressure. If the zonule is still intact, then traction toward the surgeon serves to make the inferior zonule in the vertical meridian taut, point pressure being then applied with the expressor at the 6-o'clock position. Rotation is next made clockwise, so that the forceps with the capsule in their grasp are moved to 2 o'clock, while the point pressure is made directly opposite at 8 o'clock, this being the position in which the zonule is made taut by traction at 2 o'clock. Counterclockwise rotation is then made with forceps moved to the 10-o'clock position, and pressure is made at 4 o'clock. By this coördination of rotation and traction, with its effect of tension on the zonule directly opposite, and pressure, the greatest result with the least effort and trauma is accomplished. At the exact moment of making the point pressure the forceps are held still. If a repetition of this point pressure in the three positions once or twice or possibly a third time does not bring about the desired rupture below, it may be said that the limit of safe traction and pressure has been reached. As to time, it is difficult to determine just

how long one may work safely with the zonule to effect intracapsular delivery. It would seem that five minutes should be sufficient to effect the delivery of the average cataractous lens by coördinated traction, rotation, and pressure measures as described, so that it may finally be slid or wheeled out. If a small hole or tear in the capsule above is accidentally made by the forceps, experience has shown that a second effective hold for the delivery of the cataractous lens, in capsule is possible. The rupture of the zonule, the freeing of the lens, and the time for the removal of the cataract by sliding or wheeling it out through the incision are recognized by experienced and alert surgeons. The lens in the ordinary or average case of cataract may be delivered safely in this manner.

There is need for caution. The writer has had a recent experience, which will be referred to later, that caused him to give full value to the manipulations of initial pressure, then to the pressure, traction, and rotation as before described, and to work with the lens in this manner without causing any undue trauma before deciding that the case was not of the ordinary or average resistance or fragility of zonule and before recourse was had to the procedure about to be described.

The writer's method of intracapsular delivery of cataracts with resistant, elastic zonular lamellae

If the ordinary or safe degree of the manipulation heretofore described fails to deliver the lens, it would seem improper to continue the same maneuvers that have proved inefficient for the purpose and that might be dangerous if the pressure and traction were increased. In such cases the capsule is also resistant and does not rupture. It became obvious to the writer when the difficulties of rupturing resistant, elastic zonules were encountered that other steps should be taken to deliver such cataracts in capsule. In such cases the *stripping of the zonule* from the equator of the lens in the area that is exposed to the direct view of the surgeon has been found to be a feasible and conservative process.

The normal zonule. The normal zonule in a healthy eye is undoubtedly tough, resistant, and elastic. The writer has never had the opportunity to attempt to remove the normal human crystalline lens in capsule. Such experiences should and will be obtained from eyes, otherwise normal, removed because of the presence of malignant tumors at various ages and on fresh (less than one hour deceased) cadavers. It will most probably be found that the zonule is just as tough, resistant, and elastic as were those of the normal monkey eyes on which the writer tested the qualities of the zonule. He has never encountered, even in the most difficult case of cataract in the human eye, anything approaching the resistance of this normal monkey zonule. There is undoubtedly always some degeneration of the zonule accompanying the development of cataract.

The zonular lamella. The term zonular "lamella" is used because, during the writer's intracapsular operations, attachment of the zonule has been observed to be in the form of a membrane or lamella. When a coloboma has been made by complete iridectomy and the lens is lifted vertically and tilted by the combined action of the forceps and hook, the equator may be plainly seen; extending from this, in cases favorable for such observations, is a thin semitransparent, crinkly, glassy, or cellophanelike sheet of zonular lamella. Troncoso,[7] Duke-Elder,[8] Gold-

smith,[9] and others have described the parts of this zonular membrane. Apparently the strongest or most important part is attached to the anterior equatorial area of the lens. Through the zonular membrane, when the lens is lifted, may occasionally be seen the face of the vitreous, and one is enabled to determine whether the vitreous body is relaxed and in a correct posterior position, or whether it is under tension and bulging forward. There is normally more or less space between the equator of the lens and the zonular lamella and the face of the vitreous. In normal cases this space is at least 3 mm. deep when the lens is lifted, and only in such cases may the maneuver of stripping the zonule from the equator of the lens be employed.

The instrument used in the stripping of the zonule. With the lens-capsule forceps holding the superior equator of the lens slightly upward in a safe position, the elbow of the lens-expressor hook is applied to the curved surface of the easily visible equator of the lens, and the zonular lamella, which is under tension by being lifted, is thus stripped from the equator. The attachment of the zonule, which previously seemed tough and resistant, now seems to dissolve at the most gentle touch. First a dehiscence is seen, then a disinsertion, and finally a circumferential tearing on rotation occurs. Here again the principle of tension through traction and the application of point pressure for the greatest effect with the least effort is employed. After tearing of the central area of the zonule has started, the lens is rotated clockwise to 2 o'clock on the corneal dial, and the zonule touched or stripped from 12 to 10 o'clock, then counterclockwise rotation is made to 10 o'clock and the zonule touched or stripped from 12 to 2 o'clock. At the exact time of the touching or stripping, the forceps, having effected the tension by traction and rotation, are held still. A variation that may occur is that of circumferential tearing, which may develop on rotation when once a dehiscence or disinsertion has been started.

The final delivery of the cataract after stripping of the zonule. Between 10 o'clock and 2 o'clock the zonule is exposed over an arc of 120 degrees, and is vulnerable, in direct view, to a safe approach of direct interference by the surgeon by means of coördinated traction, rotation, and pressure. When once disinsertion has been effected over these 120 degrees, further tearing generally occurs fairly easily by rotation combined with pressure, inferiorly, through the cornea, opposite the point of traction. One may finally deliver cataractous lenses with resistant zonular lamellas safely, sliding or wheeling them out without continued or excessive pressure and without repeating efforts that are ineffective.

The discovery of the maneuver of stripping of the zonule. The maneuver of stripping the zonule was first discovered by the writer when he saw it occur as he was lifting the border of the iris over the equator of the lens with the aid of the elbow of the lens-expressor hook. This observation, and the further tearing of the zonule on rotation of the lens, led him to attempt this stripping of the zonule in other difficult cases.

The removal of the embryo lens in capsule. The author's experience in removing the crystalline lens of the 5-day chick embryo is interesting in connection with the latest procedure of stripping the zonule from the equator of the lens when cataract has formed. The reader may be familiar with the research[10] of the writer on the cultivation of crystalline-lens epi-

thelium *in vitro* and the manner of obtaining the specimen of lens epithelium not contaminated by other cells. The writer removed the vitreous, lens, and a ring of pigment from the eye of the 5-day-old chick embryo and by microscopic (×24) dissection removed the lens from the other tissues by stripping the zonule from the equator of the developing lens. It was perfectly feasible at this stage of development. At the later stages of embryonic development the zonule became more resistant, and it was more difficult to remove the lens in capsule.

The recent experience which taught the writer caution. The recent experience that caused the writer to revalue the manipulations which he has used and described for the intracapsular extraction of cataract in eyes with intact zonule was that of the loss of a small amount of vitreous in a manner that seemed directly connected with the stripping of the zonule above. It was the first experience of its kind in a consecutive series of approximately 300 patients operated upon in a period of six years since the maneuver of the stripping of the zonular lamella from the equator of the lens was first used. In the early part of this period final recourse was had to this manipulation only in about 15 percent of the cases. No reference was made to it even though it was shown in motion pictures of the writer's surgery in many places. After the publication of the article[1] dealing with this as a new method, the desire expressed by visiting surgeons to see the method led to its gradually being used more and more even to a slight degree in cases in which delivery might have been effected if the coördinated pressure, traction and rotation had been persisted in for a slightly longer period of time.

In the case referred to the eye was operated upon very recently—in May, 1943. The indications seemed clear for an uncomplicated intracapsular delivery with round pupil. The pupil was well dilated. After a short period of initial pressure, then pressure, traction, and rotation, the inefficiency of the grasp of the forceps on the capsule midway between the upper equator and the central area of the lens became apparent.

The lens in which an immature cataract had developed, was soft; it had a small nucleus which did not tilt well on pressure. The grasp of the capsule away from the equator did not permit the upper pole to be lifted well. The zonule did not rupture easily. Stripping of the zonule above was resorted to at an early stage and under the disadvantage of not having the superior equator properly lifted away from the vitreous body. Separation of the zonule from the equator was effected through an arc of 90 degrees but vitreous presented and finally a small amount was lost upon delivery of the lens in capsule. It can be truthfully reported that this is the first such case in which the vitreous was endangered or lost as a result of this special manipulation. The lessons to be learned are four in number: (1) The decision that the case is a difficult one and that the zonule is too resistant to be delivered safely by pressure, traction, and rotation otherwise should not be made until these maneuvers have been given their full value. (2) The method of stripping the zonule should not be regarded as one which may be applied to all classes of cataract. It should be reserved for the cases which are proved difficult by the failure of preceding manipulations and by observations and should be part of a system of intracapsular cataract extraction. (3) Surgeons who use the method should not plan to do it in a particular case before the operation is in progress. (4) Particular care must be exercised in the place-

ment of the grasp of the forceps. The area of the capsule picked up should be very close to the anatomic equator of the lens. In practice when there is a hard nucleus of the lens which will tilt on pressure, the capsule over the new or adventitious equator of the tilted lens may be straddled and grasped. If the lens is soft, the capsule at the anterior face of the equator may be grasped. This is more easily accomplished in the presence of a complete coloboma by iridectomy. With the round pupil, especial care must be exercised to place the forceps on the peripheral part of the capsule. The observation that the zonule is lifted free from the hyaloid of the vitreous must be made before the stripping of the zonule is begun.

Preparation for cataract extraction in a difficult case. If a difficult extraction is anticipated in a certain case, as in a relatively young person, 30 to 50 years of age, who has a resistant zonule, a complete iridectomy may be done, the advantage of the round pupil being given up for the greater ease of operating and the safety of the delivery of the cataract in capsule. If the round-pupil operation has been started and capsule has been grasped in an advantageous position near the upper equator, the grasp should not be relinquished. In such difficult cases the zonule can be safely stripped off, but if the grasp is poorly placed it may be well to give it up, even though a second grasp in the same or different area will expose the weakness of the area of the capsule first grasped and may lead to its rupture at that site. If the important feat of a grasp near the equator is not accomplished and the lens cannot be lifted satisfactorily from the vitreous body, the stripping operation should not be employed. If the iris has interfered too much, a complete coloboma should be made for the second attempt. There are cases in which it seems desirable to shift the placement of the forceps on the capsule at or near the lower equator and to effect the delivery of the lens by tumbling. However, there is no possibility of using effectively any other maneuvers than those of traction and pressure and limited rotation with the forceps in the lower position. The writer is convinced of the advantages of the grasp at or near the upper equator.

Results. A report of statistics of results obtained following the procedures described in the system of intracapsular cataract surgery is in the press and will appear shortly.

Summary and Conclusions

The development of a system of intracapsular cataract surgery by which particular techniques are adapted to the case in hand has been described. The basis of the system is concerned chiefly with the condition of the lens capsule, cortex, zonule, and vitreous. Observations made before and during the progress of the operation guide the surgeon in his selection of the procedure to be employed. An ineffective procedure is not repeated. The application of the system has been made not only to the eyes with cataracts in which the zonule is intact but also to those in which the lens is luxated or subluxated. The description of procedures applicable to the latter more or less follows the literature, except for the suggestion that at times it may be necessary to strip off the resilient, resistant portion of zonule that is present in the case of young persons who have congenital malformations.

The methods used in intracapsular extraction in cases with intact zonules represent a further development of the procedures that have been previously de-

scribed by the writer. The cases are divided into three classes: First, a small group of those in which the zonule is fragile, and traction or pressure alone or a combination of them may be employed for the relatively easy delivery of the cataract. Second, the large group of cases in which the zonule has the average resiliency and resistance and in which an average degree of pressure, traction, and rotation of the lens clockwise and counterclockwise should succeed. The exact method of using these procedures is described. Third, a small percentage of cases in which the zonule exhibits greater-than-the-average degree of resistance and in which, when this is recognized, the maneuver of stripping off the zonule is resorted to after the other procedures have been used within the limits of safety. A particular case is described which taught the need for caution. It is recognized that in all cases of cataract formation there is more or less degeneration of the zonule. It is worthwhile to have a procedure which is effective and safe, when used properly, when others have failed. The conditions under which the manipulations of stripping off the zonule may be employed are described in detail. A report of statistics or results obtained following the procedures described in the system of intracapsular surgery is in the press and will appear shortly. The author's procedures for intracapsular surgery have been described before, but not in the present systematic form. It was said before that they were feasible. Now it is reported that they are conservative and desirable.

780 Park Avenue.

References

[1] Kirby, D. B. Procedures in intracapsular cataract extraction, A new method. Amer. Jour. Ophth., 1942, v. 25, March, no. 3, pp. 269-277.
[2] ———. A system of intracapsular cataract extraction. Ibero-Amer. Ophth., 1943 (in press).
[3] Verhoeff, F. H. Simple and safe method for removing cataract dislocated into fluid vitreous. Amer. Jour. Ophth., 1942, v. 25, June, p. 725.
[4] Kirby, D. B. Prevention and handling of complications arising during and after cataract extraction. Arch. of Ophth., 1941, v. 25, May, pp. 866-901.
[5] Verhoeff, F. H. A new method for removing cataracts with their capsules. Trans. Amer. Ophth. Soc., 1927, pp. 54-64.
[6] McLean, J. M. New corneo-scleral suture. Arch. of Ophth., 1940, v. 23, March, pp. 554-559.
[7] Troncosco, M. U. Personal communication, March 31, 1941.
[8] Duke-Elder, W. S. Textbook of ophthalmology. St. Louis, C. V. Mosby Co., 1932, v. 1, pp. 130-134.
[9] Goldsmith, J. Slit-lamp observations during experimental intracapsular extraction of cataract. Arch. of Ophth., 1939, v. 22, Nov., pp. 792-808.
[10] Kirby, D. B. A study of the nutrition of the crystalline lens. Trans. Amer. Acad. Ophth. and Otolaryng., 1926, pp. 137-153.
———. The cultivation of lens epithelium in vitro. Jour. Exp. Med., 1927, v. 45, June, 1, no. 6, pp. 1009-1016.

A COMPARISON OF THE OCULAR REACTIONS OF PIGMENTED AND ALBINO RABBITS TO NORMAL HORSE SERUM*

Intraocular followed by intravenous injection

T. F. Schlaegel, Jr., Lt. (MC), M.D.
Indianapolis

The purpose of this report is fourfold:

1. To compare ocular reactions in pigmented and albino rabbits.
2. To use an allergic mechanism consisting of intraocular followed by intravenous injection of normal horse serum.
3. To compare effects observed at three different intervals of time intervening between intraocular and intravenous injections: 1, 7, and 14 days.
4. To study the histopathologic features of the injected and fellow eyes at variable periods after the intravenous injection.

Schlaegel and Davis[1] have shown that a close resemblance to the histopathologic picture of sympathetic ophthalmitis can be produced in rabbit eyes receiving an injection of normal horse serum. This report is a continuation of a study of the reaction of the rabbit eye to normal horse serum, using another allergic mechanism and employing a comparison of the reaction in pigmented and albino rabbit eyes.

Seegal and Seegal[2] showed that "Eyes which had been sensitized with a foreign protein uniformly failed to respond to the intravenous injection of the homologous substance until at least the fifth day. Although slight inflammatory response could be produced in a few animals on the sixth to the tenth day after sensitization, it was quite evident from the majority of experiments that the eye response reached a maximum from the tenth to the fifteenth day or even later after local sensitization."

The report of Seegal and Seegal considered only the gross ocular reactions. This report includes both gross and microscopic studies.

The comparison of pigmented and albino rabbits was undertaken in an attempt to throw some additional light on the pigment-allergy theory of sympathetic ophthalmia. A minor purpose was to compare results with those of Riehm[3] who concluded that horse serum absorbed from one eye produced an elective sensitivity in the fellow eye, resulting in uveitis in pigmented rabbits but not in albinos. This conclusion was based on experiments with 18 rabbits, 2 of which were albinos. His method was to drain the anterior chamber of the right eye and to replace the aqueous with the same amount of horse serum. The point of the needle was inserted into the root of the iris and 0.25 c.c. to 0.50 c.c. of horse serum was injected. He used various procedures in each of the 18 animals. As an example of the type of procedure and of the results obtained, there follows a report on one of his pigmented and on one of his albino rabbits.

His pigmented rabbit number 144 was injected, as herein described, on the 1st, 12th, 13th, and 14th days, with a total of 1.05 c.c. of horse serum. An intravenous injection of 20 c.c. of horse serum was given on the 40th day; an iritis developed and reached its height on the 47th day. The periphery of the choroid was invaded by foci which gradually became pigmented and resembled fine spotted chorioretinitis. On the 139th day he gave a second intravenous injection of 20 c.c. which was followed in 7 days by a recur-

* From the Research Division, Indiana University School of Medicine, Indianapolis, Indiana.

rent iritis and cloudy cornea. On the 155th day, under atropine mydriasis, he observed at least 100 rather large and new white foci of the choroid.

His albino rabbit number 147 was injected in the right eye on the 1st, 11th, 13th, 15th, 17th, 22d, 46th, and 57th days. applications of 2 drops of 4-percent butyn. A 27-guage needle was inserted 5 mm. behind the limbus at the 12-o'clock meridian. One tenth of a cubic centimeter of normal horse serum was then injected into the vitreous.

Three series of rabbits were used. In

TABLE 1

GROSS LIVING AND MICROSCOPIC RESULTS OF THE INJECTION OF NORMAL HORSE SERUM THROUGH THE CILIARY REGION OF THE RIGHT EYE FOLLOWED BY AN INTRAVENOUS INJECTION *one day* LATER

Rabbit Number P=pigmented	Gross Reaction* after Intraocular		Gross Reaction* after Intravenous		Days from Intrav. till Enucleation	Microscopic Study		
						Right Eye		Left Eye
	O.D.	O.S.	O.D.	O.S.		Degree of Infiltration**	Giant Cells†	
P738	+	0	+	0	½	Normal		Not done
P750	+	0	+	0	1	Normal		Not done
P760	+	0	+	0	2	Normal		Not done
P759	+	0	+	0	7	2+	0	Not done
P758	+	0	+	0	14	4+	2+	Not done

* +=slight reaction as sluggish pupillary response and slight congestion at the injection site.
++=moderate congestion and slight iritis.
+++=pronounced congestion, chemosis, and more iritis.
++++=extreme congestion, chemosis, strands of exudate on iris and in pupil.
0=no change in eye.

** 1+=minimal cellular infiltration of uvea or upon optic disc—always by monocytes, often by lymphocytes and epithelioid-like cells also.
2+=cellular infiltration by monocytes, lymphocytes, and epithelioid-like cells filling the normal thickness of the choroid.
3+=distension of choroid by cellular infiltration sometimes including giant cells.
4+=distension of choroid to several times its normal thickness always including giant cells and many epithelioid-like cells.

† 1+=one or two giant cells in routine six sections.
2+=three to 10 giant cells in routine six sections.
3+=over 10 giant cells in routine six sections.

The total injection of horse serum was 2.5 c.c. During this treatment he failed to find any changes in the left eye. After 20 c.c. of intravenous horse serum was injected on the 111th day, he noticed only conjunctival injection and spastic pupil in the left eye.

PROCEDURE

For this report the following procedure was followed: All rabbits were examined grossly at the start with the aid of a flashlight, and those with eyes inflamed from any cause were discarded. The right eyes were anesthetized by three

the first series (table 1) 5 pigmented rabbits received an intraocular injection, followed 24 hours later by an intravenous injection of 1.0 c.c. of normal horse serum. The eyes were then enucleated at variable periods from one-half to 14 days. This series was considered a test group, since from the work of Seegal and Seegal we did not expect to obtain a reaction.

The second series (table 2) was composed of 12 pigmented and 12 albino rabbits. (Some of the rabbits died and were replaced by rabbits treated in the same manner.) The intravenous injection

followed the intraocular injection by seven days. At each of 6 different intervals from one-half to 21 days, 2 pigmented and 2 albino rabbits were killed and their eyes enucleated.

The third series (table 3) also was composed of 12 pigmented and 12 albino rabbits. (In this group also some of the rabbits died and were replaced.) The procedure differed from that of series 2 only in that the interval between intraocular and intravenous injection was 14 days.

In all three series the gross reactions were studied the days following the intraocular and intravenous injections. Routinely, six sections stained with hematoxylin and eosin were made of both right and left eyes. But all eyes (both right and left) of series 2 and 3 which were apparently normal in the routine 6 sections were studied further in 6 more sections cut in different areas. To ascertain correctly the absolute amount of infiltration, serial sections should be made, but it was felt that in this experiment such a procedure would not be worth the effort required.

TABLE 2

GROSS LIVING AND MICROSCOPIC RESULTS OF THE INJECTION OF NORMAL HORSE SERUM THROUGH THE CILIARY REGION OF THE RIGHT EYE FOLLOWED BY AN INTRAVENOUS INJECTION *one week* LATER

	Rabbit Number	Gross Reaction* after Intraocular		Gross Reaction* after Intravenous		Days from Intrav. till Enucleation	Microscopic Study			
							Right Eye		Left Eye	
		O.D.	O.S.	O.D.	O.S.		Degree of Infiltration**	Giant Cells†	Degree of Infiltration**	Giant Cells†
Pigmented	P999	+	0	+	0	½	Normal		Normal	
	P746	+	0	+	0	½	1+	0	Normal	
	P532	+	0	++++	0	1	2+	0	1+#	0
	P1000	+	0	+	0	1	1+	0	1+#	0
	P595	+	0	++++	0	2	2+	0	1+#	0
	P904	+	0	+	0	2	1+	0	Normal	
	P531	+	0	+++	0	7	3+	0	Normal	
	P909	+	0	+	0	7	2+	0	Normal	
	P785	+	0	+	0	14	1+	0	Normal	
	P910	+	0	+	0	14	2+	2+	1+#	0
	P529	+	0	+	0	21	2+	0	Normal	
	P905	+	0	+	0	21	1+	0	1+#	0
Albino	A754	+	0	+	0	½	Normal		Normal	
	A175	+	0	+	0	½	1+	0	Normal	
	A739	+	0	+	0	1	1+#	0	1+#	0
	A110	+	0	+	0	1	1+	0	1+#	0
	A769	+	0	+	0	2	1+#	0	Normal	
	A108	++	0	++	0	2	1+	0	Normal	
	A747	+	0	+	0	7	1+#	0	1+#	0
	A115	+	0	++	0	7	2+	0	Normal	
	A748	+	0	+	0	14	1+	0	Normal	
	A141	+	0	++	0	14	3+	1+	1+#	0
	A736	+	0	++	0	21	1+	0	1+#	0
	A103	+	0	++	0	21	1+	0	Normal	

*, **, †=Cf. table 1.
#=Eyes normal in routine six sections but positive in six extra sections.

GROSS REACTIONS

After the intraocular injection, the right eyes as a rule showed only a minimal reaction such as would be expected to result from the trauma of injection. However, a few of the right eyes responded to a degree greater than the expected minimum. This may have been

due to the activation of a latent ocular infection or to a transient infection incident to the injection.

After the intravenous injection in series 1, there was no increase in the minimal response. In series 2, one third of the animals, and, in series 3, more than one half of the animals developed a more substance until the fifth day and the reaction is maximum at about 14 days.

Further evidence that 14 days is a period of maximum allergic response is seen in the high percentage of rabbits which died in convulsions a few minutes after the injection. One fourth of the animals in series 3 died in this manner as

TABLE 3

GROSS LIVING AND MICROSCOPIC RESULTS OF THE INJECTION OF NORMAL HORSE SERUM THROUGH THE CILIARY REGION OF THE RIGHT EYE FOLLOWED BY AN INTRAVENOUS INJECTION *two weeks* LATER

	Rabbit Number	Gross Reaction* after Intraocular		Gross Reaction* after Intravenous		Days from Intrav. till Enucleation	Microscopic Study			
							Right Eye		Left Eye	
		O.D.	O.S.	O.D.	O.S.		Degree of Infiltration**	Giant Cells†	Degree of Infiltration*	Giant Cells†
Pigmented	P918	+	0	++	0	½	3+	0	1+#	0
	P907	+	0	+	0	½	2+	0	Normal	
	P914	+	0	+	0	1	1+	1+	Normal	
	P937	+	0	+	0	1	2+	0	Normal	
	P916	+	0	++	0	2	4+	2+	Normal	
	P915	+	0	+	0	2	1+#	0	Normal	
	P936	+	0	++	0	7	1+	0	Normal	
	P935	+	0	+	0	7	1+	1+	1+#	0
	P923	+++	0	+	0	14	1+	0	1+#	0
	P922	+	0	+	0	14	1+	0	Normal	
	P955	+	0	+++	0	21	1+	0	1+#	0
	P921	+	0	++	0	21	1+	0	Normal	
Albino	A135	+	0	++	0	½	3+	0	Normal	
	A111	+	0	++	0	½	2+	0	Normal	
	A829	++	0	++	0	1	1+	0	1+	0
	A828	+	0	++	0	1	1+#	0	Normal	
	A187	++	0	++++	0	2	4+	3+	Normal	
	A812	+	0	++	0	2	2+	0	Normal	
	A836	+++	0	+++	0	7	1+	0	1+	0
	A142	+	0	+	0	7	1+	0	1+#	0
	A807	++	0	++++	0	14	2+	0	2+	0
	A146	+	0	+	0	14	1+	0	1+	0
	A162	+	0	+	0	21	1+	0	Normal	
	A116	+	0	+	0	21	1+	0	Normal	

*, **, †=Cf. table 1.
#=Eyes normal in routine six sections, but positive in six extra sections.

than minimal reaction. This increased reaction was found more frequently in the right eyes of albino rabbits than in the right eyes of pigmented rabbits. The reason for this may have been the greater visibility of congestion in albino irides.

Thus we confirm, in our limited series, the conclusions of Seegal and Seegal that rabbits fail to respond *grossly* to the intravenous injection of the homologous compared to one eighth of those in series 2 and none in series 1.

In all three series the left eyes consistently failed to show gross evidence of reaction.

MICROSCOPIC RESULTS

In this report attention is focused on the histopathologic features.

Series 1 (table 1). The number of

rabbits is inadequate. The right eyes were free of cellular infiltration until seven days after the intravenous injection. The response at 7 days was moderate and the one at 14 days pronounced.

A detailed report of the histopathologic findings will not be given, as they were very similar to those previously reported.[1] P758 was a typical four-plus reactor (fig. 1). There was a dense uveal infiltration which swelled the choroid to several times its normal thickness. The cells were mainly monocytes with a fair percentage of lymphocytes, plasma cells and epithelioid-like cells, and a few giant cells. There was slight perivascular infiltration of the sclera. The retina was disorganized and had gliosis on its surface. The pigment epithelium was scalloped owing to ballooning of its cells, and the iris was densely infiltrated in its posterior half.

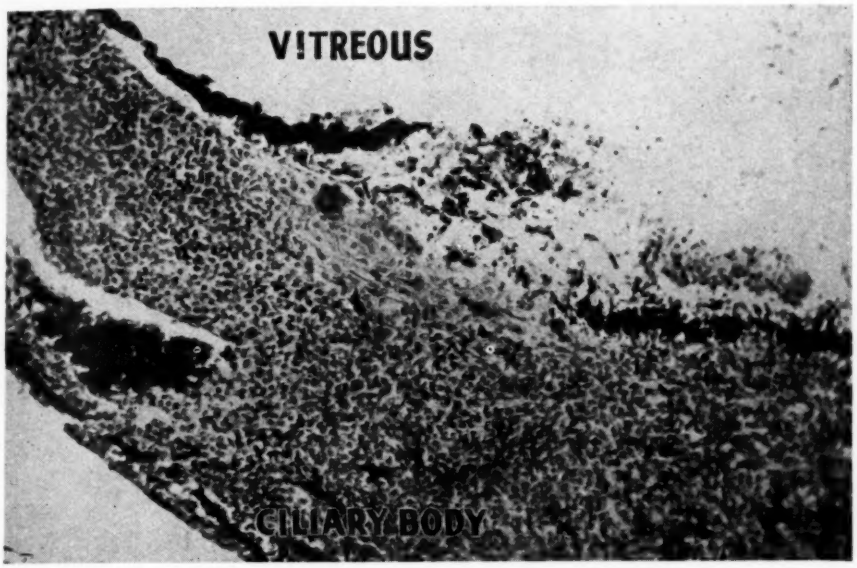


Fig. 1 (Schlaegel). The ciliary body is swollen by a mononuclear infiltration to over twice its normal size. A nodule of epithelioid-like cells (including a small giant cell) is bursting through the pigment epithelium into the vitreous. Part of a dilated and engorged vein is on the left.

Series 2 (table 2). In this series all right eyes but that of one albino and of one pigmented (half of those enucleated after 12 hours) were found to have cellular infiltration of the uvea. The degree of cellular infiltration was more pronounced in the pigmented group.

All *left* eyes were apparently normal in the routine six sections, but further study in six more sections revealed a slight uveal infiltration in 5 of the 12 pigmented and in 5 of the 12 albinos.

Guillery[4] in his work using tuberculotoxins as a sympathogenic agent has said that by studying all sections he has yet to find an experimental animal with no findings in the secondary eye. It has also been the experience of pathologists that serial sections will often make possible a diagnosis of sympathetic ophthalmia in enucleated human eyes when a few routine sections fail to show the characteristic change.

It must be kept in mind, however, that the infiltration in the left eyes was very slight. Also, in a study of a series of un-

treated apparently normal rabbit eyes, such an infiltration was occasionally found. We cannot conclude, therefore, that all of the slight infiltrations in either right or left eyes were due to a reaction to horse serum.

Series 3 (table 3). In this series the microscopic cellular infiltration as well as the gross clinical reaction reached its height. The severity of the infiltration in the pigmented and albino subgroups was equal.

It has already been shown that rabbits receiving only an intraocular injection of normal horse serum fail to respond until after about 14 days.[1] This "incubation period" may depend on the time necessary for the vitreous lipase[5] to cause sufficient change in the horse serum to release the active exciting agent. Or it may depend on an allergic reaction as a result of the development of an antigen-antibody complex after 14 days.[2] The stimulating agent is probably the lipoids or their derivative fatty acids.[6, 1]

It is interesting that in series 3 both the gross and microscopic reactions were no more severe than if no intravenous injection had been made.[1] Apparently the intravenous injection was a superfluous addition to the allergic reaction that occurs after 14 days in eyes receiving only an intraocular injection. However, in both series 1 and 2 definite cellular infiltration appeared before 14 days had elapsed. It is thus probable that in the first two series the activation of the horse serum in the right eyes was hastened by the allergic response to intravenous horse serum. Although an allergic reaction was not observed grossly in series 1, there may have been an intraocular change undetected by external examination.

Of the left eyes, 4 of the 12 pigmented

Fig. 2 (Schlaegel). The folds between the densely infiltrated ciliary processes are filled with an exudate consisting mainly of epithelioid-like cells.

and 5 of the 12 albino rabbits had a slight uveal infiltration. Although the infiltration was minimal, it was of the same character as an infiltration of similar degree in the right eyes. It consisted of one or two small nodules of monocytes and lymphocytes in the uvea and had none of the features of tubercular granulation tissue seen in the right eyes of severe reactors.

Discussion of Histopathology

Polymorphonuclear leucocytes were uniformly absent from all the sections studied. This was probably due to a change of the normal alkaline condition of the eye to the acid side of neutrality as a result of the first intraocular injection.[1] Polymorphonuclears predominate when the tissues are alkaline but are replaced by mononuclear cells when the tissues become acid.[7]

There are two histopathologic features of the reaction of the rabbit eye to normal horse serum which we failed to discuss in our previous paper:

1. E. Fuchs[8] pointed out that in sympathetic ophthalmia a cellular infiltration consisting mainly of epithelioid cells is seen to break into the vitreous from the ciliary body, filling the spaces between the folds of the corona ciliaris. Such a response was observed in our intense reactors (fig. 2). The filling-in of the folds is another fact further[1] differentiating the reaction to normal horse serum from that of panophthalmitis, for in panophthalmitis the cells lodge at the tips of the corona.

2. E. Fuchs[8] also described a bursting of epithelioid cells from the choroid into the subretinal tissues and even into the vitreous. The boundaries of the cells become sharper and assume a spindle shape. They may grow to form long thin strands. These cells are distinguished from true connective tissue because they stain yellow with Van Gieson stain, whereas connective tissue stains red. Such a phenomenon was observed in a few of the severe reactors (fig. 3).

Sabin, Doan, and Forkner[6] have pointed out that the epithelioid cell is not

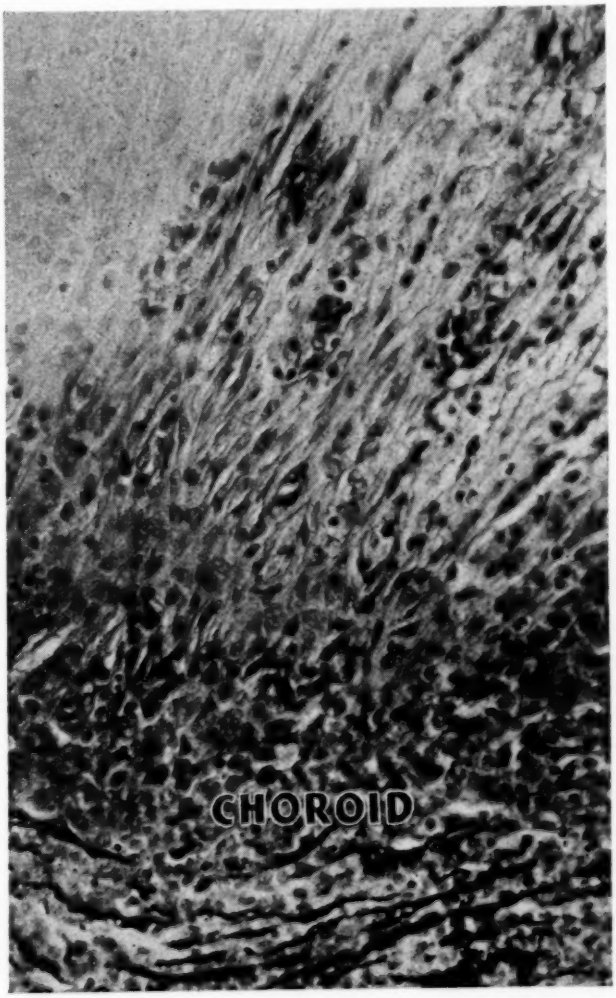


Fig. 3 (Schlaegel). Elongated spindle-shaped cells are growing out from the choroid into the vitreous.

the immediate reactor to active chemical substances. Preceding its appearance there is a maturation of new young monocytes. They found the epithelioid cells appearing by the fourth day.

In this experiment epithelioid-like cells were seen by the fourteenth day in series 1, after the first day in series 2, and after one-half day in series 3. These time intervals are measured from the time of intravenous injection. The total period from the time of the first injection into the right eye was more than four days in all three series. The epithelioid-like cells were found in greatest number early in the third series.

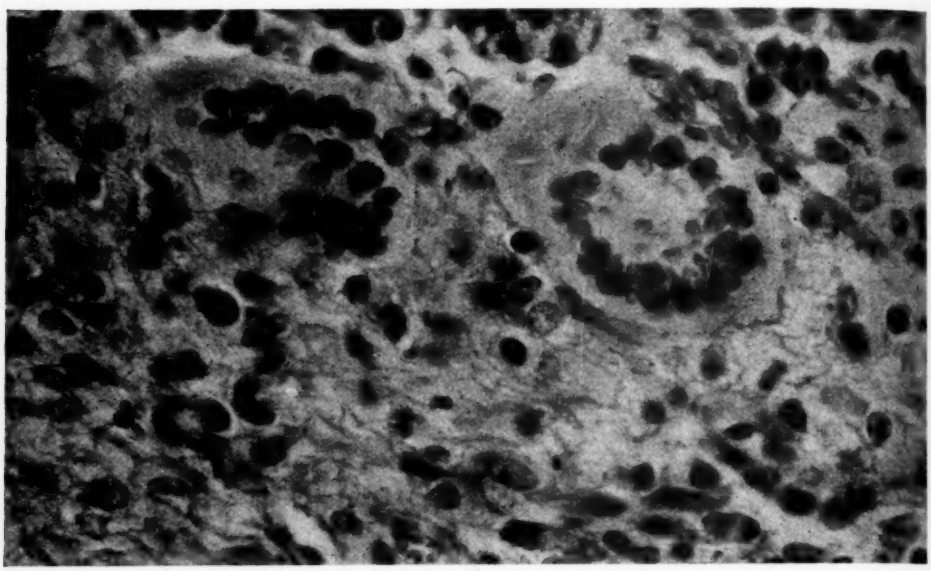


Fig. 4 (Schlaegel). (Albino 187.) Two giant cells (one foreign-body type and one Langhans type) are seen lying in the choroid surrounded by a diffuse infiltration consisting mainly of epithelioid-like cells. The giant cells have engulfed cellular débris.

In a previous paper[1] we defined the term epithelioid-like cell and used it for cells appearing like epithelioid cells except that the nucleus was usually round instead of the characteristic bent shape. In this series the epithelioid-like cells (a term we shall continue to use because we do not have proof that they are epithelioid cells by supravital staining) are more typical in appearance. It may be that the cells previously described, and many seen in the sections of this experiment, were young and in the stage of transformation from monocytes to epithelioid cells.

Although epithelioid-like cells were usually present, they were not always found and were seldom present in great numbers except in eyes with a three- or four-plus reaction. E. Fuchs[8] pointed out that epithelioid cells are often difficult to find and may possibly be lacking entirely in sympathetic ophthalmia. He also noticed that they were more numerous when the cellular infiltration was intense.

A comparison of the giant cells in the pigmented and albino groups failed to reveal any essential difference. Both foreign-body and Langhans types were present. In the pigmented group these cells had phagocytosed pigment granules, whereas in the albino group other débris was present in the cytoplasm (fig. 4). In

regard to the scarcity of giant cells in the infiltration in this experiment, it should be pointed out that Fuchs stated they were present in but one half of his cases of sympathetic disease.

Comment

Upon comparing the results of this experiment with those of a method previously reported,[1] in which the rabbits were first sensitized by intradermal injections and then injections were made into the right eye, we find that the degree of cellular infiltration is less and the number of giant cells is fewer.

The conclusion of Riehm,[3] that horse serum absorbed from one eye produces an elective sensitivity in the fellow eye resulting in uveitis only in pigmented rabbits, has been much quoted. This conclusion was based on gross and ophthalmoscopic findings and apparently did not include microscopic study. In series 2 of this experiment, the first four albino right eyes studied were found to be normal, as compared to only one normal pigmented right eye. Also, the gross reaction in the first four albino rabbits was very minimal. Our premature impression, therefore, was that albino rabbits were not going to respond to the intraocular followed by an intravenous injection of normal horse serum. However, upon doubling the number of rabbits and upon a search in additional sections we found this presumption to be untrue.

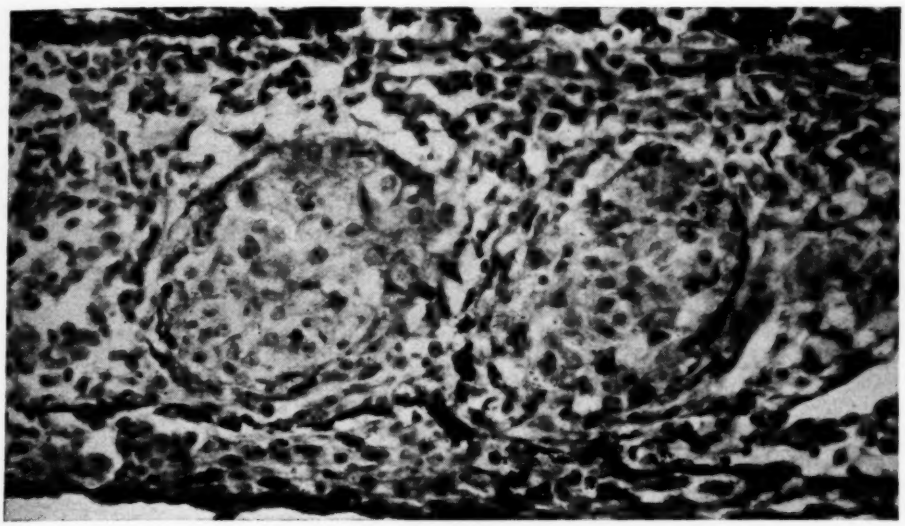


Fig. 5 (Schlaegel). Two nodules of epithelioid-like cells are lying in a heavy mononuclear infiltration of the choroid.

Although the cellular infiltration in the left eyes was minimal, there was an equal response in pigmented and albino rabbits. If we had used horse serum in as large doses and with as repeated injections as did Riehm, it is possible that the response in the left eyes would have been more intense. Although no essential difference was found in the reaction in pigmented and albino rabbit eyes, it must not be concluded that the pigment-allergy theory is discredited. The procedure here followed is, most probably, far removed from the actual etiologic mechanism of sympathetic ophthalmitis. Also the involvement of the left, or sympathizing eyes, was far too

slight to be conclusive. The pigment-allergy theory has much factual backing, and pigment very likely plays some role in the development of sympathetic ophthalmia.

However, tubercular granulation tissue such as is seen in sympathetic ophthalmia has been shown to be due to the stimulation of some lipoids or their derivative fatty acids.[6] Therefore, it is improbable that melanin is the actual exciting agent since as far as we know it does not contain lipoids or fatty acids.[9]

Conclusions

1. Gross and microscopic ocular reactions were essentially equal in pigmented and albino rabbits.

2. The allergic mechanism of intraocular followed by intravenous injection of normal horse serum is less effective in producing gross and microscopic results than the method of sensitization by intradermal injection prior to injection made into the right eye.

3. Gross and microscopic reactions were most pronounced when the intravenous followed the intraocular injection by 14 days.

4. The microscopic picture of the injected eyes of severe reactors bore a close resemblance to that of sympathetic ophthalmia. The uveal infiltration in the non-injected eyes was very slight but was present in 40 percent of the cases.

References

[1] Schlaegel, T. F., Jr., and Davis, J. B. The reaction of the rabbit eye to normal horse serum; sensitization by intradermal injection. Amer. Jour. Ophth., 1943, v. 26, pp. 785-798.

[2] Seegal, D., and Seegal, B. C. Local organ hypersensitiveness. III. Further observations on the experimental production in the rabbit eye. Jour. Exper. Med., 1931, v. 54, pp. 249-263.

[3] Riehm, W. Ueber die Bedeutung der Anaphylaxis für den klinischen Ablauf der sympathischen Ophthalmie, der Tuberkulose und der organgebundenen Infektionskrankheiten (nach Studien am Auge). Arch. f. Ophth., 1929-1930, p. 375.

[4] Guillery, H. Klinisches und Histologisches zur Sympathisierung des Kaninchenauges. Arch. f. Augenh., 1928, v. 99, p. 69.

[5] Krug, E. F. An investigation of the ferment activity of the rabbit's vitreous. Trans. Amer. Ophth. Soc., 1931, p. 451.

[6] Sabin, F. R., Doan, C. A., and Forkner, C. E. Studies on tuberculosis. Chap. 1, Reaction of the connective tissues of the normal rabbit to lipoids from tubercle bacillus, strain H-37. Jour. Exper. Med., 1930, v. 52, suppl. no. 3, pp. 3-69.

[7] Menkin, V. Studies in inflammation. X. The cytological picture of an inflammatory exudate in relation to its hydrogen-ion concentration. Amer. Jour. Path., 1934, v. 10, p. 207.

[8] Fuchs, E. Ueber sympathisierende Entzündung (nebst Bemerkungen über seröse traumatische Iritis). Arch. f. Ophth., 1905, v. 61, p. 365.

[9] Veer, W. L. C. Melaninen Hun Chemie en Hun Beteekenis. Chemisch Weekblad, 1940, v. 37, p. 214.

PRESENT LIMITS OF GONIOSCOPY*

PETER C. KRONFELD, M.D., AND H. ISABELLE MCGARRY, M.D.
Chicago, Illinois

After having been a scientific hobby of a few investigators for about 30 years, gonioscopy has finally become a routine method of examination in many clinics and private offices. A wealth of new observations has been made and recorded in the literature.[1] To take inventory of the new knowledge, as far as it pertains to the glaucomas, could be done in several ways. We have chosen to do it by stressing the present limits of gonioscopy, limits as they apply to the physical procedure, to the availability of definite, characteristic findings and to the interpretation of such findings. Such a presentation may serve to define the present-day status of gonioscopic knowledge more briefly and concisely than would a discussion of all the established facts.

Gonioscopy has been expected to give information with regard to: (1) the patency or accessibility of the angle of the anterior chamber; (2) the function or permeability of the corneoscleral trabeculum; (3) involvement of the anterior portion of the ciliary body in an inflammatory or neoplastic disease of the uvea; (4) abnormal tissue-elements or foreign bodies in the angle; (5) how and why surgical operations in the region of the angle have succeeded or failed to normalize the intraocular pressure.

In the glaucomas gonioscopy is chiefly concerned with items 1, 2, and 5. The part played by peripheral anterior synechiae (PAS) in the mechanism of the glaucomas has certainly been greatly elucidated and clarified by the advent of gonioscopy, but it would not be true to say that gonioscopy has "straightened us around" on that subject. Even in the pregonioscopic era we knew from pathologic as well as clinical observations that among the so-called primary glaucomas there are: (1) cases in which closure of the entrance to the chamber angle by contact between iris and lateral angle wall constitutes the primary pressure-elevating mechanism, and (2) cases in which the intraocular pressure becomes and remains elevated in the presence of an entirely open angle. It was also known that in some of the cases of the latter group during the course of the glaucoma PAS can develop which have not played a part in the original pressure-elevating mechanism but may aggravate the situation. While it is true that the names, "congestive" or "inflammatory" on the one hand and "chronic simple glaucoma" on the other hand did not express the principal difference between the two types of glaucoma, the existence of such a difference was fully realized in the pregonioscopic era. Our enthusiasm over the classification of the so-called primary glaucomas into the narrow-angle and the wide-angle type (O. Barkan), which terms express the principal difference between the two types much more clearly, should not make us forget that their existence had been postulated from anatomic as well as clinical evidence long before anybody ever saw the chamber angle in a living eye.

With regard to the narrow-angle type, it may be of interest to hear that W. Czermak[2] in 1897 gave a fairly accurate description of its mechanism: "Through progressive senile increase in the volume of the lens and perhaps also of the ciliary processes . . . the anterior chamber of the senile eye becomes shallow, which consti-

* From the Illinois Eye and Ear Infirmary (Chief of Staff, Dr. Harry S. Gradle). Read before the Chicago Ophthalmological Society, March 15, 1943.

tutes a predisposition to glaucoma. If the pupil dilates under the influence of a mydriatic or in the dark as through stimulation of the sympathetic, the crowded-together root of the iris comes in contact with the posterior surface of the cornea and the connection between anterior chamber and chamber angle is closed off. By continued action of Schlemm's venous plexus the aqueous is siphoned out of this closed-off pocket. The pressure in it drops while it rises in the remainder of the anterior chamber. Thus the root of the iris . . . is sucked or, by the pressure of the aqueous in the posterior chamber, pressed into the angle."

The concept of a temporary contact between iris and lateral angle wall as a cause of acute rises of the intraocular pressure in anatomically predisposed eyes received support from the clinical studies of Gröenholm,[3] Seidel and Serr,[4] and, finally, was proved to be correct by H. S. Sugar's gonioscopic observations[5] of the actual occurrence of the contact immediately before the rise of intraocular pressure. Gonioscopy thus has played an important part in establishing the mechanism of narrow-angle glaucoma. Practically, it has enabled us to determine whether or not in a given case the anatomic predisposition—namely the narrowness of the entrance to the angle—is present. This is an important point, since narrowness of the angle entrance is not always associated with all-over shallowness of the anterior chamber.

The gonioscopist sometimes finds it difficult to answer the question, whether or not an eye with a certain degree of narrowness of the angle is actually in danger; that is, whether the angle-crowding that is likely to occur in normal life is sufficient to lead to temporary closure of the entrance to the angle. He tries to answer this question by investigating (after Sugar) the effects (1) of moderate mydriasis produced by drugs, and (2) of accommodation. If both of these two angle-crowding factors do not bring the iris in contact with, or very close to, the lateral angle wall, the gonioscopist is tempted to consider the degree of angle narrowness as innocuous and the patient not in danger. The question is whether we actually know and are able to reproduce at will all natural angle-crowding factors. Besides emotion (through factors other than mydriasis) and upper respiratory infections which were considered by Sugar in his work on the mechanism of acute glaucoma,[5] there may be still other angle-crowding factors. While the general opinion seems to be that eyes with potential or definitely established narrow-angle glaucoma differ only in one respect from the normal eye—namely, in their anatomic angle configuration—there is a remote possibility that the anterior uvea in these eyes does undergo sudden increases in volume to a greater extent than does the normal eye. In a number of cases in which artificial mydriasis plus accommodation did not produce closure of the entrance to the angle and therefore no embarrassment of the intraocular pressure, weeks or months later a spontaneous rise of the intraocular pressure occurred which could not be attributed to any *known* angle-crowding factor. The practical conclusion should be that the distinction between dangerously or innocuously narrow angle entrances cannot always be made with absolute certainty and that any eye with marked narrowness should be considered as being in danger.

To what extent the angle, in established narrow-angle glaucoma, has become closed off by permanent peripheral anterior synechiae (which develop if the contact is not interrupted fairly promptly by miotics, surgery, or spontaneously) can usually be determined with great accuracy. Difficulties arise in the extreme degrees of shallowness of the anterior chamber in which one usually finds rela-

tively small and flat corneas combined with an extreme forward-position of the iris-lens diaphragm. In gonioscopic lingo, in these cases, we are not able to get over the iris hump. It seems unlikely that by a further modification of the contact lens some of these angles could be rendered visible. As stated by Sugar, the lens of type A seems more suitable for the examination of such shallow chambers than the lens of type C. Still, certain angles have to be described as being too shallow for gonioscopy and the question whether there is a narrow cleft leading down to the apex of the angle or whether there are peripheral anterior synechiae has to be left unanswered. We have found that when the PAS reach considerable extent in meridional direction the iris hump does become less pronounced, the iris taking on the shape of a chord where it used to be an arc. Thus the presence of flatter, straighter iris sectors in eyes with very shallow anterior chambers is suggestive of PAS in those sectors.

The presence of corneal edema is no insuperable obstacle since by massage with a glass rod, according to Larsson,[6] or by the instillation of glycerine (Cogan[7]), a portion of the cornea can be cleared sufficiently to permit gonioscopy.

The close parallelism between closure of the angle and elevation of the intraocular pressure which has been found in innumerable instances in which before the formation of the PAS the intraocular pressure was normal, constitutes weighty evidence in favor of the concept that the human eye depends largely upon the trabeculum–canal-of-Schlemm mechanism for maintenance of a normal intraocular pressure. Because of the general importance of this concept the closeness of this parallelism between closure of the angle and intraocular pressure in eyes without any artificial new outlet for the intraocular fluid has been the subject of special investigation. An apparent lack of parallelism is seen occasionally in eyes with acute congestive glaucoma in which an iridectomy completely and permanently controls the intraocular pressure although most of the chamber angle seems to be closed. A similar situation is found in a very small percentage of the cases which, as a result of prolonged absence of the anterior chamber after cataract operations, have developed extensive PAS. Such exceptions from the general rule of parallelism have been explained by Sugar[8] as being due to minute iris incarcerations which, while not big enough to cause any visible permanent gaps in the operative incision associated with gross blebs in the overlying conjunctiva, allow a sufficient amount of filtration to keep the intraocular pressure at a normal level. In some of these cases Sugar was able to "raise" minute blebs by massage of the eye. The presence and patency of such minute subconjunctival fistulas is difficult to prove conclusively. There have been a number of histologic reports indicating their presence where they had not been seen nor expected clinically. On the other hand, small iris incarcerations in the presence of closed angles very often fail to control the intraocular pressure permanently, especially if in the eye in question the natural channels of outflow were insufficient before the PAS formed. Whatever the role of small iris incarcerations may be, there are cases of narrow-angle glaucoma which have been controlled by iridectomy without iris incarceration although more than three quarters of the angle appeared to be closed. To us these cases seem to indicate that in narrow-angle glaucoma in which the normal channels of outflow function normally until the entrance to the angle becomes obstructed or PAS form, a small accessible portion of the trabeculum is sufficient for maintenance of normal intraocular pressure. It also seems possible that in such eyes filtration takes place through tiny

gaps in the PAS as well as around the synechiae into open-angle pockets.

All in all, gonioscopy gives satisfactory explanations for most of the phenomena observed in narrow-angle glaucoma. The name seems to have been well chosen, the closure-inviting narrowness of the angle being the main if not the sole cause of the glaucoma. The term "wide-angle glaucoma" has no such positive meaning; it refers to a negative characteristic of this large and very heterogeneous group of glaucomas; namely, the absence of any visible obstacle to the passage of aqueous into the trabeculum. What little there is in the way of positive characteristics of this group, could not be included in its name. Here the limits of gonioscopic knowledge are very apparent. In the absence of any obstruction within the angle the gonioscopist's natural move was to look for signs of decreased permeability of the corneoscleral trabeculum. O. Barkan even went so far as to use the term "trabecular" as a synonym for wide-angle glaucoma and as the counterpart to narrow-angle or iris-block glaucoma, although he does mention, under the general heading of trabecular glaucoma, a secretory or neurogenic variety.

The gonioscopic recognition of impaired function of the corneoscleral trabeculum has proved most difficult. In our work on the visualization of the canal of Schlemm by drawing blood into it,[9] we observed a few cases of advanced wide-angle glaucoma in which the trabeculum seemed definitely less transparent than normally, which may have been a sign of sclerosis. Bangerter and Goldmann[1] describe veiling of the anterior surface of the ciliary body in some of their wide-angle glaucomas, which may have meant lessened permeability of the uveal portion of the trabeculum that overlies the ciliary body. This veiling, unless it is very pronounced, may be difficult to recognize and to distinguish from the normal. We have seen it, but it is rare.

Gonioscopy has been responsible for a revival of or renewed interest in the pigment-block theory of some glaucomas. A considerable percentage of all wide-angle glaucomas show excessive pigmentation of the trabeculum, but in the majority of them the degree of trabecular pigmentation varies within the same wide limits as in nonglaucomatous eyes of the same age and racial group. Table 1 shows the degree of pigment infiltration of the trabeculum in 200 nonglaucomatous and 150 wide-angle glaucomatous eyes of individuals over 40 years of age.* While these numbers are probably too small and the estimation of the pigment content by gonioscopy too inaccurate to permit definite conclusions, the amount of pigment present in the trabeculum of nonglaucomatous eyes seems to depend upon the pigment content of the iris, and excessive pigmentation seems to occur only in glaucomatous eyes. Thus only excessive pigmentation has come to be recognized as being characteristic of some wide-angle glaucomas in which it has diagnostic significance. It must be remembered that the absence of excessive pigmentation by no means rules out wide-angle glaucoma. In many wide-angle glaucomas the appear-

TABLE 1

RELATIVE INCIDENCE (PERCENTAGE) OF THE VARIOUS DEGREES OF TRABECULAR PIGMENTATION IN NONGLAUCOMATOUS AND WIDE-ANGLE GLAUCOMATOUS EYES OF SUBJECTS OVER 40 YEARS OLD

Degree of Pigmentation	Controls		Primary Wide-Angle Glaucoma	
	Iris blue or gray	Iris hazel or brown	Iris blue or gray	Iris hazel or brown
None	59	9	16	15
Slight	29	58	24	30
Moderate	11	32	40	32
Excessive	0	0	20	23

* This work was done by Drs. H. S. Koch and T. H. Luo in the Glaucoma Clinic of the Illinois Eye and Ear Infirmary.

ance of the trabeculum as well as that of the rest of the angle is in no way different from that of a nonglaucomatous eye, so that by gonioscopy the glaucomatous character of the eye in question cannot be recognized.

Excessive pigmentation of the trabeculum is usually associated with signs of pigment migration in the iris and all over the anterior chamber. Gonioscopy has failed to produce any new evidence in favor of the pigment-block theory or to shed light on the finer mechanism of this quasi-type of glaucoma. The fact is disturbing that in the many cases of capsular exfoliation without glaucoma excessive trabecular pigmentation is the rule.

How difficult it is to estimate the permeability of the trabeculum from its gonioscopic appearance is well illustrated by the many cases of chronic anterior uveitis in which pigmented and unpigmented débris is deposited on and within the trabeculum. There is no apparent parallelism between the intensity of these deposits and the incidence, course, and severity of the secondary glaucoma that develops in some of these cases. Again from the gonioscopic picture of trabecular changes alone one cannot tell to what extent the balance of the intraocular pressure has been or will be disturbed. In the rare type of recurrent mild cyclitis with elevation of tension at the first and each subsequent attack during which the gonioscopic picture remains perfectly normal, it appears certain that trabecular impermeability or angle obstruction of any kind plays no part at all. This is just another example of a mechanism producing a glaucomatous state which is associated with a normal gonioscopic appearance of the trabeculum.

There is a field where gonioscopy shines; that is, the examination of the sites of anti-glaucomatous operations. After trephinings or iris-incarcerations in which the site of the operation is not completely concealed by adhesions between the iris and the anterior wound lip, gonioscopic examination affords an excellent view of the area of operation and usually a simple explanation of its failure or success. The success of both, the trephining as well as the iridencleisis, depends upon the permanent patency of the operative wound or defect. In most permanently and unconditionally successful iridencleises, a portion of the incision is kept open by the interposition of iris in one or both corners of the wound, the iris acting not as a wick but to keep the wound lips separated. Thus, in slight deviation from Sugar's idea, we are inclined to think that a sclerectomy, if added to the iridencleisis, should be made in the portion of the incision that is not taken up by the incarcerated iris. This technique would seem to give the best chance for permanent gaping of the incision. Proliferation of retinal pigment, starting from the incarcerated-iris portion, is usually fairly pronounced, but rarely sufficient to cause late closure of the operative gap. Among the cases without visible gap of the surgical incision there were permanent successes, apparently through wick-action of the incarcerated iris. More commonly, however, the intraocular pressure did not remain within normal limits and miotics had to be used. In trephining, the conditions for permanent patency of the corneoscleral defect are ideal if uveal tissue or lens is entirely absent from its rim or lumen. The greater the portion of the circumference of the hole that is lined by uveal tissue the less chance there is of permanent patency. In order to avoid these adhesions, the site of the trephining should be well outside of the area covered by the PAS, and the postoperative contact between iris and cornea should be reduced to a minimum. A trephine opening may become closed by proliferative or scarifying processes in the subconjunctival space ("from the outside in"). While gonioscopy cannot be expected to give

information concerning these processes, it explains why the operation failed in most cases in which the dissection had been carried into the stroma of the cornea, beyond the rim of Bowman's membrane. There gonioscopy reveals that the outer covering of the trephine hole, although it is directly exposed to the intraocular fluid, does not become pliable enough to form part of a bleb or even to remain detached from the remainder of the cornea.

That a successful cyclodialysis is associated with the gonioscopic picture of a permanent supraciliary cleft leading into the suprachoroidal space is now generally known. That the cleft and not an "atrophy" of the dialyzed portion of the ciliary body is the actual pressure-reducing principle is clearly demonstrated by the recurrence of hypertension if the cleft closes up. The actual depth of these "pockets" is sometimes difficult to determine, nor are the factors well understood which favor or hinder the permanent patency of the pocket.

Sugar's statement[10] that "most failures of well-performed cyclodialysis operations are due to the persistence and organization of a blood clot in the aperture of the cyclodialysis cleft" is unquestionably correct. The presence of blood or fibrin in the pocket two weeks postoperatively is an unfavorable sign, although complete absorption of such clots without closure of the pocket has been observed. We have the feeling that in the operative failures bleeding into the pocket has continued for some time or recurred several times. Electro-coagulation of the anterior ciliary arteries in the region of the cyclodialysis immediately before the latter may be of value to reduce the danger of severe hemorrhages. From purely clinical analysis, cyclodialyses made in the upper half of the globe have a better chance of remaining open than do cyclodialyses made in the lower half. Late closure apparently occurs more often in eyes in which the original pocket was narrow in meridional direction. Thus eyes with very shallow chambers appear to be less favorable subjects for cyclodialysis than eyes with deep anterior chambers. This point has been emphasized by Bangerter and Goldmann,[1] who apparently have used cyclodialyses more widely than ophthalmologists in any other large clinic. For the reason that the upper portion of the angle is usually the narrowest, Bangerter and Goldmann prefer to make the cyclodialyses temporally, in a location avoided by Sugar because of the danger of injury to the long posterior ciliary artery. Since this artery enters the ciliary body in the posterior portion of the orbiculus, a cyclodialysis can be performed temporally without injury to the artery. Bangerter and Goldmann contend that in the presence of a very narrow angle an iridectomy prior to the cyclodialysis improves the chances for a permanent patency of the latter. The available gonioscopic evidence is equivocal with regard to the effect of preëxistent PAS upon the permanent patency of a cyclodialysis pocket; although it would seem logical that, in an angle sector that is free of PAS, a cyclodialysis can be performed with greater ease and less trauma than in a sector closed off by PAS.

Summary

The present status of gonioscopy may be summed up by listing some of its plus as well as its minus values.

Plus values of gonioscopy: 1. Gonioscopy offers a simple mechanical explanation for certain glaucomas. 2. Gonioscopy helps choose the type of operation most suitable for the case under consideration. 3. Gonioscopy helps recognize the causes of failure of glaucoma operations. 4. The information obtained by gonioscopy is of prognostic value in that it enables us to tell whether or not a filtering operation will continue to function. 5. The information obtained by gonioscopy may be of

value in inflammatory and traumatic diseases of the eye.

Minus values of gonioscopy: 1. Gonioscopy offers no explanation of the mechanism of certain glaucomas. 2. Gonioscopy requires some special equipment. From 2 to 4 hours are required to learn the technique of gonioscopy. Considerable experience is required to interpret cases in which the landmarks have been obliterated. 3. Gonioscopy is conducive to the development of an over-mechanical concept of glaucoma.

References

[1] Barkan, Otto. Amer. Jour. Ophth., 1941, v. 24, p. 768.
Sugar, H. S. Arch. of Ophth., 1941, v. 25, p. 674, and 1942, v. 28, p. 315.
Bangerter, A., and Goldmann, H. Ophthalmologica, 1941, v. 102, p. 21.
[2] Czermak, W. Prag. Med. Woch., 1897, pp. 1-5.
[3] Grönholm, V. Arch. f. Augenh., 1910, v. 47, p. 142.
[4] Serr, H. Deutsche Ophth. Ges., Heidelberg, 1925, v. 45, p. 22.
[5] Sugar, H. S. Amer. Jour. Ophth., 1941, v. 24, p. 851.
[6] Larsson, S. Acta Ophth., 1939, v. 17, p. 297.
[7] Cogan, D. G. Amer. Jour. Ophth., 1943, v. 26, p. 551.
[8] Sugar, H. S. Arch. of Ophth., 1941, v. 25, p. 700.
[9] Kronfeld, P. C., McGarry, H. I., and Smith, H. E. Amer. Jour. Ophth., 1941, v. 25, p. 1163.
[10] Sugar, H. S. Amer. Jour. Ophth., 1942, v. 25, p. 667.

TORSION IN PERSONS WITH NO KNOWN EYE DEFECT*

Thomas G. Hermans
Seattle, Washington

From the numerous experiments that have been performed on the problem of torsion throughout the last 100 years, there has emerged no clear understanding or agreement among current authoritative sources. Physiologists hold that through the combined action of the external muscles of the eyeballs torsion does not occur; whereas ophthalmologists tend to regard it as abnormal. Starling,[1] Best and Taylor,[2] Howell,[3] and MacLeod,[4] either state specifically or imply that torsion does not occur. Ames and Gliddon[5] report from the Dartmouth Medical School measurement of cyclophoria (torsion) in clinical patients "suffering more or less acutely from their eyes." They speak of "cyclodeclination condition," "cyclotorsional trouble," "abnormal cyclotorsional condition," and "suffering from cyclodiplopia" as if torsion were an abnormality of vision, yet they apparently have no facts as to what normal persons, or nonclinical subjects, might show in the way of torsion. They would probably admit as does Duke-Elder[6] that a "certain amount" of torsion might be normal. For the purpose of establishing this "certain amount" the experiment herein to be reported was performed. Carow[7] is the only individual found working on the problem who seemed to realize the importance of measuring torsion in large numbers of pathologic cases. He measured torsion in 107 employees of a Berlin police station. Most of his subjects had eye defects of one kind or another, but at least they were not recruited from clinics; only 14 subjects yielded what he regarded as good data. His analysis of the data consisted only of the calculation of averages.

---

*From the Department of Psychology. University of Washington. A résumé prepared by the author of his much more detailed paper, which appeared in the Jour. Exp. Psychol., 1943, v. 32, April, no. 4, pp. 307-324.

From the foregoing considerations it seemed advisable to measure torsion in persons with no known eye defect in an attempt to answer the following questions: 1. Is torsion a normal or an abnormal phenomenon? 2. If it occurs in normal vision, what direction of torsion may be expected? 3. What is the average amount that might be expected? 4. What is the normal variability that might be expected from one person to the next? 5. Does it vary with variation in elevation of vision above and below horizontal? 6. Does it vary with changes in convergence? 7. Are the torsional movements bilaterally symmetrical for the two eyes? 8. What are the torsional changes with oblique and lateral fixation points in the visual field? 9. Is it a source of distress in vision? The following report of experimental procedure and the results obtained is an attempt to answer all but the last three of these questions.

Three essentially different methods of testing torsion have been used. Some of the conflicting statements about torsion arise as an artefact of the method used. One method frequently cited uses the afterimage. However, only the monocular afterimage may yield valid results. The binocular afterimage would not show validly the torsion in either one or both eyes, owing to the fact that a binocularly fixated point or figure, seen as single during fixation, never produces a double afterimage; the perceived position of the afterimage tends to remain a function of the positional relationships maintained during retinal fatigue. Statements by Starling,[1] Duke-Elder,[6] and Tscherning[8] are invalidated by the fact that they are based upon the use of the binocular afterimage.

A second method is that of observing directly torsion by use of a telescope with vernier scale, the cross-hairs of which can be superimposed on distinctive markings of the iris. This method is recommended for its objectivity. However, with the telescope used by Loring[9] in the local laboratory I found it difficult to discriminate with any degree of certainty changes of less than a degree. Moreover, Loring reports that pupillary changes even with constant illumination made it difficult at times to identify the distinctive marking previously sighted.

A third method of measuring torsion is

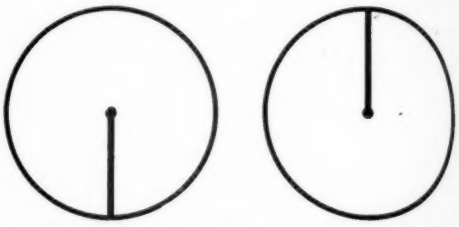


Fig. 1 (Hermans). Figures of the "Volkmann disc" type for binocular fusion.

that of presenting to the two eyes separate figures that are binocularly fused by means of some stereoscopic device when their angular rotations on the visual axes are in proper relationship. The type of figures or targets commonly used is what has come to be known as "Volkmann's discs." These are circles set at right angles to the visual axes with the centers as points of fixation; a radius is drawn on each circle, but on opposite sides of the centers, so that when one or both discs are properly rotated the radii become an apparent diameter of the circle (fig. 1). If diameters are drawn on the two circles the subject then has to discriminate when the lines are perfectly superimposed; they must fixate some point on the line and tell when there is no apparent doubling of the lines peripheral to the point of fixation. Such discrimination of double images is difficult for the naïve subject and may give unreliable results. The use of targets by Ames and Gliddon,[5] requiring peripheral discrimination of double images, plausibly accounts for their incredible report that "Usually the declination of

TABLE 1

GIVING: (1) NUMBER OF SUBJECTS, (2) OBTAINED AVERAGE VALUE OF TORSION, (3) STANDARD DEVIATION, (4) THEORETICAL AVERAGE, FROM 40° ABOVE TO 40° BELOW HORIZONTAL AND FROM 0 TO 10 DEGREES OF CONVERGENCE

	0°	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°
+40°	77	95	95	87	72	55	40	30	23	14	10
	.16	.43	.55	.71	.81	1.02	1.19	1.51	1.74	2.24	1.95
	.74	.78	.79	.85	.75	.86	.79	1.02	1.13	1.77	1.09
	.20	.33	.48	.64	.81	.99	1.18	1.38	1.60	1.83	2.06
+30°	84	103	101	95	87	67	49	37	31	25	15
	.05	.19	.30	.39	.54	.74	.78	1.14	1.54	1.82	2.00
	.57	.55	.65	.57	.66	.66	.79	.81	.98	1.04	.80
	.16	.28	.41	.56	.71	.88	1.06	1.25	1.45	1.66	1.88
+20°	85	102	103	97	93	78	52	37	31	27	22
	.04	.18	.30	.41	.51	.70	.88	.96	1.25	1.50	1.63
	.41	.40	.49	.49	.52	.56	.70	.66	.72	.64	.72
	.13	.23	.35	.48	.62	.77	.93	1.11	1.29	1.49	1.70
+10°	87	103	104	100	89	72	50	40	32	27	21
	.10	.16	.26	.38	.46	.60	.79	.92	1.09	1.31	1.63
	.41	.43	.42	.49	.52	.54	.51	.51	.55	.65	.58
	.10	.19	.29	.41	.53	.67	.81	.97	1.15	1.33	1.52
0	90	103	104	101	89	71	51	42	33	28	15
	.07	.17	.23	.35	.43	.49	.72	.91	1.08	1.08	1.28
	.30	.36	.38	.48	.52	.56	.59	.57	.46	.62	.71
	.07	.14	.23	.33	.44	.56	.70	.84	1.00	1.17	1.34
−10°	84	102	104	100	94	79	58	46	38	30	19
	.13	.19	.29	.41	.51	.62	.65	.85	1.04	1.18	1.23
	.43	.43	.46	.53	.58	.61	.61	.61	.66	.70	.66
	.04	.10	.18	.26	.36	.46	.58	.71	.85	1.01	1.17
−20°	81	102	104	101	94	80	59	43	37	27	15
	.10	.14	.22	.30	.44	.44	.57	.70	.85	.88	.83
	.44	.44	.46	.56	.57	.55	.64	.50	.52	.59	.54
	.02	.06	.12	.19	.27	.36	.47	.58	.71	.85	1.00
−30°	79	102	102	99	91	78	59	43	26	19	14
	.03	.06	.15	.23	.29	.37	.34	.41	.59	.42	.54
	.47	.45	.43	.54	.56	.57	.79	.87	.81	.58	.44
	−.01	.03	.07	.12	.19	.27	.36	.46	.57	.69	.83
−40°	69	99	104	101	92	82	64	42	32	20	11
	−.07	.01	.09	.15	.21	.26	.17	−.04	.16	.12	.13
	.51	.55	.51	.58	.66	.79	.79	.95	.69	.77	.59
	−.03	−.01	.02	.06	.11	.17	.25	.33	.43	.54	.66

the vertical meridians is greater than that of the horizontal."

From a careful consideration of the various methods of measuring torsion, it seemed advisable for the present study to use the stereoscopic technique with targets of the Volkmann disc type. They were circles 1 inch in diameter; projecting 4½ inches beyond the circles were bars one-eighth inch wide; with one circle the bar projected downward and with the other upward. In effect, these targets combined binocularly as radii of a circle 10 inches in diameter. With a system of mirrors known as a telestereoscope changes in convergence could be effected. Changes in elevation of vision were made possible by rotation of the apparatus vertically about an axis approximating the center of rotation of the subject's eyeballs. The subjects rotated the targets synchronously in opposite directions until the bars appeared to

make one continuous straight line through the stereoscopically fused circle. Their adjustment of the targets could be read to one tenth of a degree.

The subjects used in the experiment were 104 naval R.O.T.C. students who had had recent eye examinations and had been passed as "normal"; that is, with 20/20 vision and no detected visual defect. Readings of the subject's adjustment of the targets were taken at as many combinations of elevation and convergence as the subject was able to maintain binocular fusion of the targets. A few subjects found it impossible to fuse the targets with parallel axes of vision, and every one would reach some point of convergence beyond which fusion was impossible. Readings were taken only to 10 degrees of convergence; incidentally, this refers to the angular change in each eye.

A distribution of the subjects' judgments for each of the 99 combinations of convergence and elevation was made, and the average and standard deviation from the average calculated for each distribution. The values derived from these calculations are given in the accompanying table; the horizontal variable represents degrees of convergence, the vertical variable, the degrees of elevation of vision above and below horizontal. The first item in each cell of the table indicates the number of subjects able to make judgments at this combination of the two variables. The second item is the average

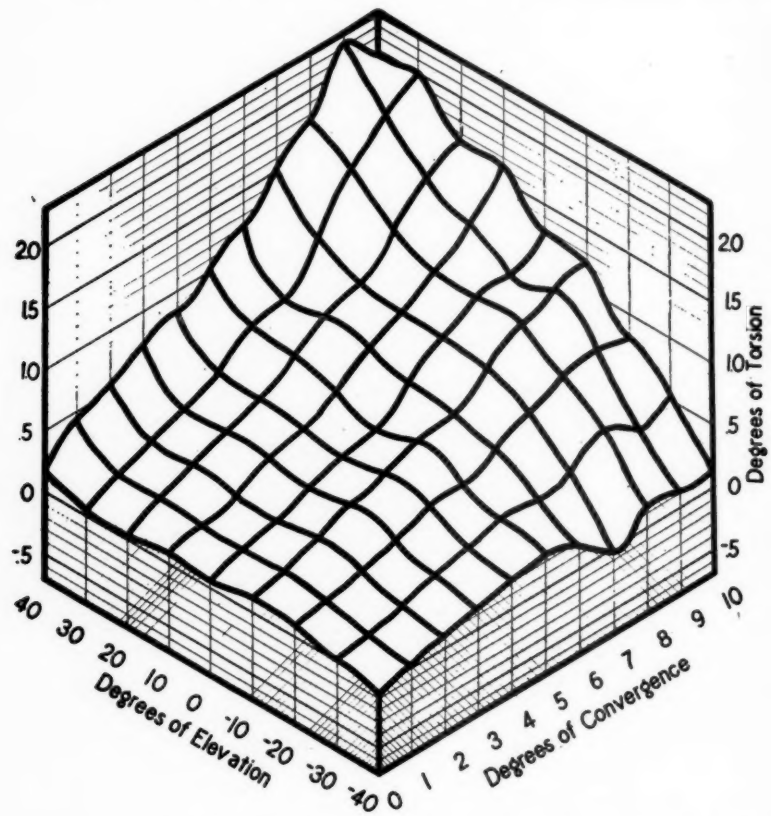


Fig. 2 (Hermans). Obtained average values of torsion plotted against the two variables, convergence and elevation of vision.

value of the subjects' adjustment of the targets. The direction of rotation of the targets is a tipping of the vertical diameters of the fused circles of the targets away from each other at their tops. Correspondingly, the rotary direction of the eyes is that which would result from unopposed contraction of the inferior oblique muscles. For simplicity in speaking of torsion we shall assume that these figures refer to torsion of the eyes; for obviously, the eyes have undergone torsion of these amounts and the targets have had to be rotated in the same amount and direction to meet the subject's requirements for judgments of straight lines. The direction of the torsion indicated (with two exceptions) is an ex-torsion or disinclination of the upper ends of the vertical meridians of the eyes from the medial plane. The two exceptions are indicated by the minus sign. The third item in each cell is the standard deviation from the average of the obtained values. This is a measure of the variability of subjects and defines the limits on either side of the average within which the middle 68 percent of the torsion values were found. To illustrate, 104 subjects made judgments with vision horizontal and with 2 degrees of convergence; the average judgment was .23 degrees, and standard deviation .38 degrees; 68 percent of their judgments were between .23 − .38 and .23 + .38 or between −.15 and +.61 degrees; the remaining 32 percent of sub-

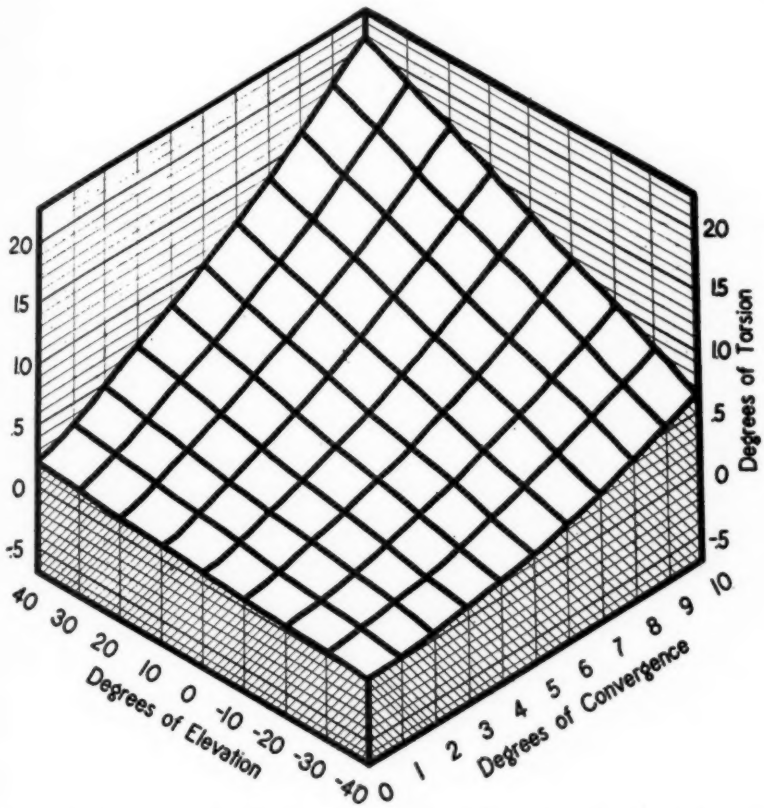


Fig. 3 (Hermans). Theoretical values of torsion plotted against the two variables, convergence and elevation of vision.

jects made judgments that deviated more than .38 degrees from the average. The fourth item in each cell is the theoretical average; how this was obtained will be explained later.

Figure 2 shows the three-dimensional surface obtained when the average values of torsion in degrees are plotted against degrees of elevation and degrees of convergence. The striking appearance of regularity of this surface suggests the desirability of obtaining an equation descriptive of the relationship between the three variables. Theoretically, the surface would be entirely smooth if a large enough number of subjects had been used. On this assumption calculations were made and the following equation derived:

$$Z = +.00573x^2 + .00001y^2 + .00148xy + .07029x + .0028y + .06876$$

Z represents degrees of torsion, x degrees of convergence, and y elevation of vision in degrees above (plus) or below (minus) horizontal.

Using this equation, theoretical values of torsion were calculated for the 99 points of the graph. The fourth item in each cell of the table is this theoretical value. Figure 3 shows this smoothed surface. To illustrate how closely the two surfaces coincide it should be pointed out that the standard deviation of the differences between the obtained and theoretical averages is .13 degrees; that is, 68 percent of the theoretical values of torsion are within .13 degrees of the obtained values.

In conclusion, torsion has been shown to be a normal phenomenon of vision. The direction of torsion to be expected is a disclination at the top of the vertical meridians of the eyes relative to the medial plane, except at extreme positions of elevation below horizontal and with a small amount of convergence; in this position the torsion is reversed. The average amount of torsion to be expected for any combination of convergence and elevation is expressed by the above equation; this may be regarded as a law descriptive of eye-movement. The amount of variability in torsion that one might expect in individual cases, and still be regarded as normal, is expressed best by the various standard deviations from the average values as indicated in the table.

References

[1] Starling. Principles of human physiology. Edited by Evans and Hartridge. Ed. 7, Philadelphia, Lea and Febiger, 1936, p. 340.

[2] Best and Taylor. The physiological basis of medical practice. Ed. 2, Baltimore, William and Wilkins Co., 1940, p. 1651.

[3] Howell, W. H. A textbook of physiology. Ed. 14, Philadelphia, W. B. Saunders Co., 1940, pp. 358-359.

[4] MacLeod. Physiology in modern medicine. Edited by Bard and others. Ed. 8, St. Louis, C. V. Mosby Co., 1938, p. 230.

[5] Ames, A., and Gliddon, G. H. Ocular measurements. Trans. Sect. Ophth., Amer. Med. Assoc., 1928; pp. 102-175.

[6] Duke-Elder, W. S. Textbook of ophthalmology. St. Louis, C. V. Mosby Co., 1939, v. I, p. 594.

[7] Carow, R. Untersuchungen über die Näherungsrollung und die Hebungs-Senkungsrollung der Augen. Arch. f. Ophth., 1939, v. 140, pp. 86-115.

[8] Tscherning, M. Physiologic optics. Philadelphia, The Keystone, 1904, p. 292.

[9] Loring, M. W. An investigation of the law of eye-movements. Psychol. Rev., 1915, v. 22, pp. 354-370.

HIGH CONGENITAL MYOPIA WITH CONVERGENT STRABISMUS*

RICHARD C. GAMBLE, M.D.
Chicago

In 1930, a child, 22 months of age, was referred to me for examination because the eyes had a definite tendency to cross when looking at close objects. The refraction, measured with the eyes under the effect of atropine, showed 16D. of myopia in each eye and, much to my surprise, the convergent squint completely and immediately disappeared as soon as the child was provided with glasses. This unusual experience prompted a reasonably thorough review of the literature on similar cases. All that one could find was a case report here and there of an infant with a high degree of myopia, but no mention of any strabismus and, most important of all, no observations over a period of years to give one any idea of what to expect in regard to the visual prognosis for children having this defect.

Many questions presented themselves. What was the cause of the strabismus, and why was it corrected by concave lenses? Was this myopia really congenital, owing to the lens being more spherical than usual, or was it axial? Do such cases progress and ultimately result in the extremely high myopia with marked retinal destruction that we see at times? This study is an attempt to answer these questions.

In the past 13 years, 25 children have been examined who had what can reasonably be called high congenital myopia. An arbitrary standard of five diopters of myopia before school age has been adhered to with a few exceptions. Myopia associated with obvious microphthalmos or ectopia lentis has not been included nor have cases of monocular myopia. Refractions have been repeated as often as indicated. In five of the patients the refraction was measured only once, so these are not included in the figures showing changes in the amount of myopia.

The following table shows most of the facts revealed by this study:

TABLE 1

HIGH CONGENITAL MYOPIA WITH CONVERGENT STRABISMUS—SHOWING AMOUNT OF MYOPIA, RATE OF PROGRESS, AND FREQUENCY OF STRABISMUS

Number of patients with high congenital myopia	25
Number of patients refracted more than once	20
Average age at first examination	4.3 years
Average amount of myopia at first examination (Max. −16.50; Min. −4.50)	−10.45D.
Average age at last examination	8.8 years
Average amount of myopia at last examination	10.88D
Average period of observation	4.1 years
Average change in refraction per year	−.18D
Number of eyes becoming more myopic (total 40)	19
Number of eyes becoming less myopic (total 40)	15
Number of eyes showing no change of refraction (total 40)	6
Number of patients with convergent strabismus (All recovered except two, in one the squint became divergent later)	15
Number of patients with divergent strabismus	1

The high incidence of convergent strabismus is remarkable. In one case the deviation was 35 degrees, in all of the others the deviation was only 10 to 20 degrees, and in many cases it was not constant. The fact that it was of low degree and usually was corrected immediately by the use of glasses suggests the possibility that it was a physiologic condition related to the fact that the far point was so close to the child's eyes. It might be assumed that, inasmuch as everything more than 10 cm. away is indis-

*Read before the Chicago Ophthalmological Society, March 15, 1943.

tinct in a case of myopia of 10D., the child makes his binocular adjustment for close objects only. Some of the facts are not in accord with this simple explanation, however. There were a few cases in which amblyopia of moderate degree could be demonstrated when the child became old enough to have suitable tests made, and in several cases fusion and stereopsis were subnormal. One child had a convergent strabismus of 20 degrees and myopia of 12D. at three years of age; the strabismus was corrected immediately by the glasses, but at the age of 11 years she developed divergence excess with 18 degrees of exotropia for distance. She had vision with glasses: R. 20/25, L. 20/15 and had good fusion and stereopsis.

It is quite obvious that this type of myopia is different in many ways from the usual axial type that begins in the early school years, increases during the years of growth, and then becomes more or less stabilized. The very slow average rate of increase (−0.18D. per year) in this series is very gratifying. These children have all been able to make satisfactory progress in school, most of them in regular school, a few in sight-saving classes, and it does not appear that the work has harmed their eyes. A myopic conus was observed in only two patients, one with 10D. of myopia and one with 15D. Other patients with just as much myopia did not have a conus nor any myopic retinal changes. In no case did the eyes appear abnormally larger or protruding; in fact, the opposite was usually the case. We are all familiar with myopia in cases of microphthalmos and ectopia lentis where the anteroposterior diameter of the globe is not abnormally great. The lack of stretching of the posterior segment of the eye and the very slow rate of increase in myopia in these congenital cases strongly suggest the possibility that the cause of the myopia is due to the lens being abnormally spherical. This assumption is in agreement with what is well known regarding the development of the infant eye. Measurements have shown that the lens of a normal eye of an infant has twice as great a curvature as in the adult. The reason this condition of the lens does not always result in the infantile eye's being myopic is that it is usually more than compensated for by the short anteroposterior diameter of the eyeball at birth. Congenital myopia will be present if the anteroposterior diameter is not short enough to compensate for the myopia owing to excessive curvature of the lens. Such myopia may decrease as the lens becomes less spherical with age unless this is offset by an increase in the anteroposterior diameter, or it may increase if the anteroposterior diameter becomes greater at a more rapid rate than is compensated for by the change in the lens. In this series the two processes apparently took place at about the same rate, so there was no marked change in the refraction.

Conclusions

1. High congenital myopia and convergent strabismus are often associated.
2. The myopia is lenticular in origin and relatively nonprogressive, at least up to the age of adolescence.
3. The convergent strabismus is of low degree, is usually corrected by glasses, and is, on the whole, relatively unimportant.

30 North Michigan Avenue.

Discussion

Dr. William F. Moncreiff: Dr. Gamble's paper presents two separate and distinct problems: first, that of congenital myopia as an etiologic factor in con-

vergent squint; second, that of the pathogenesis of congenital myopia. These two problems would appear not to be closely related, their juxtaposition in the paper being accounted for by the circumstance that in some 60 percent of the cases of congenital myopia reported, a convergent position of the eyes was observed, tabulated as convergent strabismus.

As to the role of congenital myopia as a causative factor in convergent strabismus, Dr. Gamble's remark that a child with congenital myopia of 10D. makes his binocular adjustment for close objects only, is in accord with the observations of Chavasse, who pointed out that the extreme nearness of the far point, varying from less than 6 cm. to an average of not more than 10 cm. requires such a high angle of convergence for the development of binocular single vision, that with its development must come more or less strong esophoria; this, if prolonged for a sufficient time, may be finally transformed into esotropia.

One may question whether the convergent position of the eyes observed in 15 of these congenitally myopic patients was in every instance a true esotropia. Convergence of the visual axes on near objects, to the meter angle equivalent of the distance, is a physiologic fact and necessary for binocular single vision; also, the term esotropia, or convergent strabismus, does not apply unless the convergence exists when fixating an object at a distance of 6 meters or more. How can one correlate or compare the observed angle of convergence with that appropriate to the distance of fixation when there is no accurate means of determining what the fixation distance is? Furthermore, how can an infant or child with 5 to 18D. of myopia, uncorrected by lenses, fixate an object at a distance of 6 meters which he cannot even see? The fact that convergence disappeared promptly in many cases with the application of correcting lenses adds further to the suspicion that the convergence was not that of a true esotropia.

In the nine patients in whom no convergence was observed there was an average of 10D. of myopia or more; in one case the myopia was as high as that of any other patient in the entire series. In the majority of these cases the difference in refraction between the two eyes was at one time or another only one diopter or less, and, in most of the cases, correcting lenses were first applied in the fourth year or younger. Could it be that within the limits of the far point, those with about equal myopia in the two eyes developed sufficiently good stereopsis to prevent the occurrence of esotropia? Some of the others perhaps did not begin to exercise their visual faculties to any marked extent on near objects and small details prior to the first correction of the refraction.

The essayist noted the presence of amblyopia and defects of stereopsis in certain cases in which a true strabismus persisted beyond the age of six years. Further analysis of details not reported in the paper might show the cause to be high astigmatism in one eye only, or much higher myopia in one eye than in its fellow.

As to the pathogenesis of congenital myopia, the essayist states that this is lenticular in origin. No proof of this conclusion is offered, but the idea is apparently adopted as an alternative to the more tenable one of an axial myopia. He rejects axial myopia as an explanation because (1) choroidal, retinal, and other fundus changes observed in high myopia in many adults were not present; (2) there was no significant increase in the amount of myopia in any case, and even a decrease in some cases. The first consideration is untenable; it is well known

that, with the exception of a simple conus (malformation) due to obliquity of the optic-nerve-entrance canal, these other fundus changes require some years for development, and, as a rule, are not to be seen in infants or even older children until beyond the age of puberty. The second consideration has no significance, owing to the complexity of changes occurring in the early years of growth and affecting all the factors which determine the refraction of the eye.

The three most essential factors that determine the static refraction of any nonaphakic eye are the cornea, the lens, and the axial length of the eyeball. The most variable of these in the newborn and in the developing infant, as regards their effect on total refraction, are, in all probability, the cornea and the length of the eyeball. Variations between different individuals in the size, curvature, index of refraction, and in general the refractive power of the lens of the infant or newborn are probably too small to account for anything more than a diopter or two of variation from the norm in refraction.

In the present state of our knowledge, according to such authorities as Vogt, Scheerer, von Szily, Seefelder, Wessely, and Schnabel, it may be said that congenital myopia is due to anomalous development of the eye in the anterior segment or the posterior segment or both. There may be a so-called refractive myopia, due not to a higher-than-usual refractivity of the lens, but to increased refractive power of the cornea, which has a shortened radius of curvature. This is sometimes combined with a greater-than-average diameter of the base of the cornea. An axial diameter of the eyeball of the newborn sufficiently in excess of the normal 17.5 mm. to produce 5 to 15D. or more of congenital myopia, is a mild grade of malformation due to limited overgrowth of the neural ectoderm of the secondary optic vesicle, which, in many cases, may be confined to the posterior half of the eyeball, but in others may predominate as an overgrowth of the ciliary zone, from limbus to ora serrata.

DR. ROBERT VON DER HEYDT: This paper gives good reasons for the convergence, its immediate correction by the strong minus glasses, and the high myopia as being due to the lens, which is quite spherical in some very young children. Children born with high lenticular myopia need not necessarily later develop progressive myopia; this is a quite separate hereditary fate.

Dr. Moncreiff apparently agreed with Dr. Gamble except for differentiating between myopia of corneal origin and that of lens origin. Both essayist and discusser should be congratulated on presenting the problem so lucidly.

DR. RICHARD C. GAMBLE (closing): In regard to the first point brought up, Dr. Moncreiff seems to be even more inclined to the idea of physiologic convergence than I am. As to the second point, Dr. Moncreiff has studied sections of infants' eyes and is well aware of the fact that the lens in an infant's eye is more spherical than it is in the adult. It is hard to understand why he does not consider this fact important.

Dr. Von der Heydt in his long experience has apparently observed some of the things described in this paper, and it is gratifying to hear him say so. He himself has had to find them out by watching the patients as they grew up.

ROBERT VON DER HEYDT.

COATS'S DISEASE

JOSEPH LAVAL, M.D.
New York

Through the courtesy of Dr. David H. Webster, I am able to present the pathologic findings in a case of Coats's disease. The history of the case as given by Dr. Webster follows:

"I first saw R. P. on September 9, 1941. The mother stated that the right eye was closed at birth, and that at three months of age a convergent squint was first noticed. When the child was 7½ years old the muscles of the right eye were operated upon for the correction of this deformity, and at the age of 8½ years a further attempt was made to correct it. Following that she tried occlusion and muscle exercises. The patient is now 10 years of age. When I saw her she had a head tilt, ptosis of the right lid, and extreme photophobia; the eyeball appeared shrunken; vision was 1/200 in the lower field. The slitlamp showed new blood vessels in the iris; the latter was pushed forward against the cornea in the region of the 7-o'clock position. The ophthalmoscope showed massive exudative retinitis with plaques of pigment; transillumination was difficult. A diagnosis of Coats's disease was made. The eye was removed on September 29th on account of extreme photophobia and constant headaches."

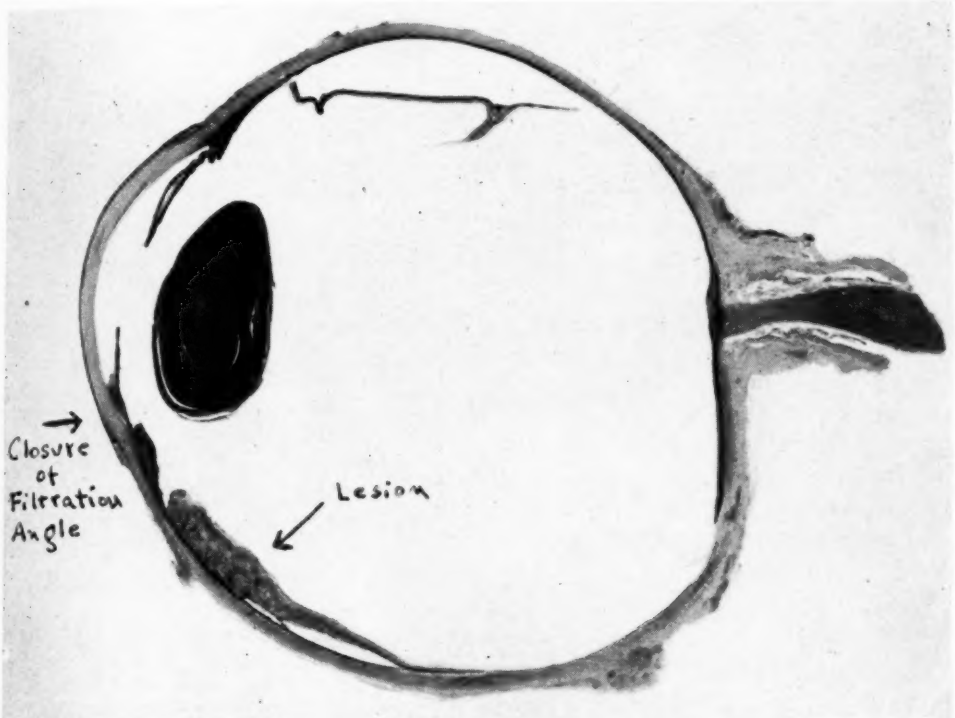


Fig. 1 (Laval). The involved area occupies all the layers of the retina, Note the adhesion of the iris to the posterior layers of the cornea with resultant closure of the filtration angle. The ciliary body is not involved.

The gross and microscopic findings are as follows:

The eyeball is normal in size and shape. In the lower portion of the retina anteriorly is a small raised mass extending toward the vitreous and reaching from the ciliary body toward the equator (fig. 1). The ciliary body is not involved. Most of the mass is in close apposition to the choroid, but a small part of it posteriorly is lifted away from the choroid by albuminous fluid. The filtration angle is occluded by the iris, which is adherent to the cornea below. Microscopically it is seen that there is marked proliferation of pigment on the anterior surface of the iris with a moderate increase in round cells and free pigment lying in the filtration angle. The mass in the retina is cellular and contains cells having deeply staining nuclei which are round cells, but most of the cells are fibroblasts with spindle-shaped nuclei. There is much connective tissue (fig. 2). Occasional vessels are present in the mass and round cells envelop these vessels. Clumps of pigment are present and proliferation of the pigment epithelium is moderate. In the inner layers the blood vessels of the retina are preserved, but the walls are thickened. The inner limiting membrane of the retina is intact. In the outer layers, the rods and cones are completely destroyed, and here some goblet cells are seen, which may

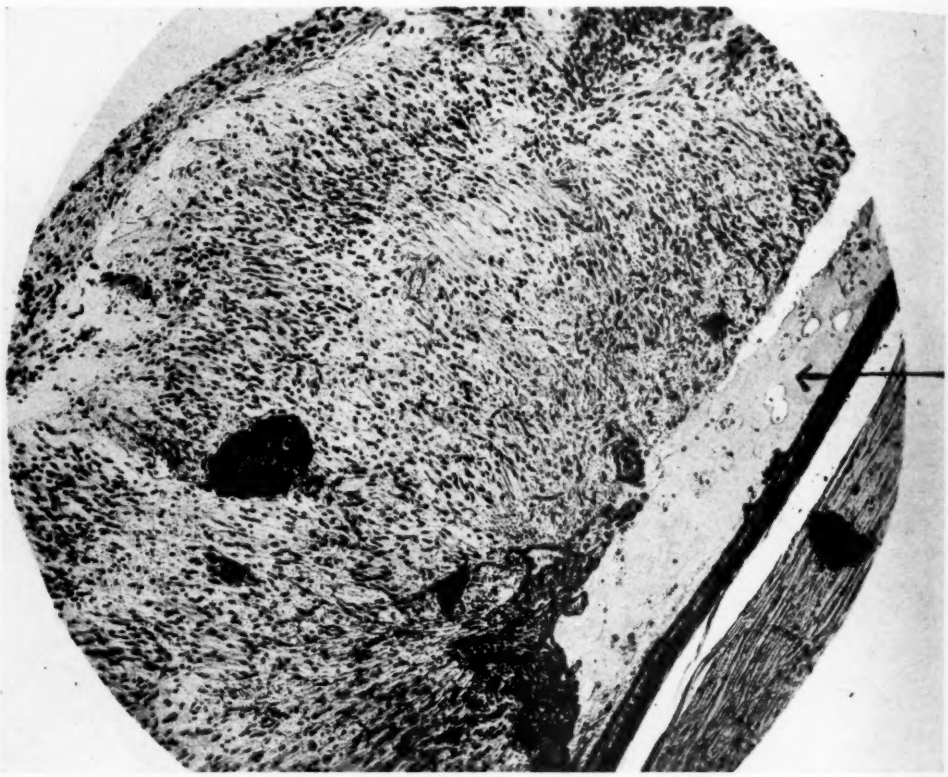


Fig. 2 (Laval). Marked connective-tissue proliferation. The arrow points to albuminous fluid between the choroid and the mass. Two drusen of the lamina vitrea can be seen below the arrow. To the left of the center is seen a dense mass of pigment. (Low power.)

be swollen cells of the destroyed rods and cones (fig. 3). The other nuclear layers of the retina are gone, and in their place are connective tissue, round cells, and fibroblasts with clumps of pigment. The choroid is partly involved but in other places is intact, with fluid between it and the retina. Here the lamina vitrea is swollen into drusen with pigment epithelium overlying them. Prepared with the Wilder stain it is seen that the mass is predominantly connective tissue with moderate vascularization.

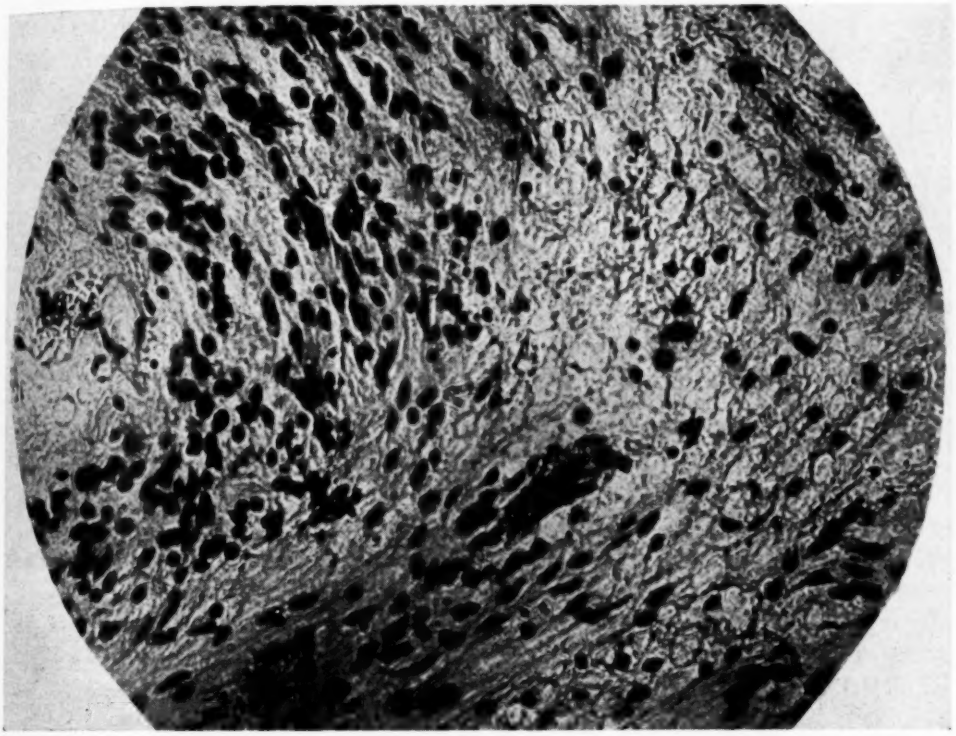


Fig. 3 (Laval). High power, showing goblet cells or "ghost cells."

Comment

Coats's[1] original presentation consisted of 11 cases, 4 of which were in females and 7 in males. Of these 11, 5 were in patients between the ages of 6 and 8 years; 1 patient was 12 years old, and 5 were between 26 and 37 years old. The majority of the patients presented by other writers were between 2 and 19 years of age; the majority were also males. The condition is found rarely in patients over 25 years of age, and was once reported in a child of 10 months.[2]

According to Coats's original concept the lesion is primarily vascular and hemorrhagic. The proliferation of neuroglia that takes place and that is so profuse at times as to give the appearance of a veritable tumor is only secondary. Retinal detachment, proliferation of pigment epithelium, and new-formed connective tissue follow later. Leber,[3] however, considers the lesion as essentially inflammatory and necrotic; following the inflammation, there ensues necrosis of the retinal tissues, desquamation of the pigment epithelium, and formation of hemorrhages and exudates. The picture is vari-

able, so that in some cases vascular and hemorrhagic features are pronounced whereas in others these factors are minimal, and inflammatory exudation and organization are more prominent. The choroid is usually not involved but may at times be involved secondarily. The retina in the affected area is extremely degenerated and almost completely replaced by fibrous tissue; the vessels are sclerosed, and glial tissue proliferates to varying degrees with destruction of the neural elements.

Some observers believe that the origin of the vascular lesions is infectious owing to small infected emboli; others believe the origin to be tuberculous. In some cases the angiomatous formations are so large that some consider the original lesion to be the aneurysmal dilatation with angiomatous formations which finally cause exudative changes in the retina with detachment. (This latter, however, is really Hippell[4]-Lindau's disease and does not belong to the group designated Coats's disease.)

Coste[5] in 1938 reviewed the entire literature and found that 29 cases had been reported in males and 22 in females, making a total of 51 up to that time; he included 2 cases of his own. His bibliography is quite complete. Lamb[6] in 1938 also reviewed the literature and added eight cases. He concluded that the "essential change is an infiltration of the retina in whole or in part with albuminous and edematous fluids, leading to an exudate of the same fluids under the retina and a resulting complete or partial detachment of the retina. The . . . late cases are further distinguished by the presence of large amounts of connective tissue between the choroid and the retina or in the retina." He further states that the exudative process is diffuse throughout the retina and not only in the external layers as Coats found it. He agrees, however, that an inflammatory process is present and for that reason agrees with Coats's later concept of "exudative retinitis." Lamb makes the point that the pigmented epithelial cells of the retina become macrophages and then are transformed into fibroblasts. These then proliferate and lay down the dense masses of connective tissue found in cases of Coats's disease. Clinically, there are large yellowish-white masses of exudate in the fundus, lying under the retinal vessels which may be obscured in places, however. Most commonly these masses are at the posterior pole but not uncommonly they are in the periphery. Hemorrhages are frequently present and often cholesterinlike glistening deposits are seen. The vessels may be tortuous or looped, or even occasional anastomoses may be present. Detached retina, glaucoma, iridocyclitis may ensue; in other cases the process goes just so far and then remains stationary, while in some a pseudogliomatous mass may be formed.

An interesting paper by Holm,[7] published in Copenhagen, in 1941, makes the point that there is a great similarity between Coats's disease and retinitis circinata and also macular proliferation both of the senile and juvenile types. In studying the pathology of these various conditions one is struck by the great similarity and also by the overlapping of the fundus pictures as seen clinically. In Duke-Elder's text book are compiled all the views and reports of different observers of the accepted pathologic pictures of these allied conditions.

Summarizing then, it may be stated that Coats's disease and circinate retinopathy depend primarily on changes in the retinal arterial system, whereas senile and juvenile macular degeneration are the result of changes in the choriocapillaris.

136 East Sixty-fourth Street.

References

[1] Coats, G. Ophth. Rev., 1911, v. 30, p. 289. Royal London Ophth. Hosp. Rep., 1908, v. 17, p. 440. Arch. f. Ophth., 1912, v. 81, p. 275.
[2] Marshall and Michaelson. Trans. Ophth. Soc. United Kingdom, 1933, v. 53, p. 102.
[3] Leber, T. In "Handbuch der gesamten Augenheilkunde" (Graefe-Saemisch). Ed. 2, Leipzig, William Engelman, 1916, v. 7, pt. 2, p. 1267.
[4] V. Hippell. Arch. f. Ophth., 1913, v. 86, p. 443; 1931, v. 127, p. 27.
[5] Coste, M. Contribution a l'étude de la rétinite de Coats. Thèse de Paris, 1938, no. 19. Paris, Vigot Frères, Editors.
[6] Lamb, H. D. Amer. Jour. Ophth., 1938, v. 21, no. 6, 618.
[7] Holm, S. Acta Ophth., 1941, supplement 19, Copenhagen, E. Munksgaard, Publisher.

POSTOPERATIVE ENDOGENOUS INFECTION OF THE EYE WITH RECOVERY

Report of two cases

Daniel Kravitz, M.D.
Brooklyn, New York

and

Lloyd J. Duest, M.D.
New Bedford, Massachusetts

Postoperative infections of the eye may be ectogenous or endogenous. In the first instance, infection shows itself 24 to 48 hours following an operation, usually cataract extraction.

The first sign is a grayish edema of the cornea around the incision and edema of the nearby conjunctiva. The infection has a tendency to spread rapidly and soon a hypopyon makes its appearance. Shortly the entire cornea becomes hazy, the conjunctiva greatly chemotic, and, before long, the vitreous is invaded. Usually there is an outpouring of purulent material through the wound of the cornea. In the majority of cases the eye requires enucleation or it eventually shrinks to an extreme degree.

According to Fuchs,[1] endogenous infections are usually the result of septic emboli thrown off by septic foci, invading a local point made less resistant as a result of trauma (operation), in the same way that an osteomyelitis may involve bone at the point of local injury. The condition, while it occurs occasionally in an eye which has been operated upon under the best possible circumstances (asepsis, operative technique, and the like), is thought to occur more frequently if there has been excessive ocular manipulation.

This type of infection usually shows itself on the fifth or sixth day following an operation, though a much earlier appearance has been reported.[2] The initial reaction is not apt to be so virulent. There is some clouding of the cornea, moderate circumciliary reaction, and a small amount of hypopyon. As the infection progresses, the hypopyon increases and the reaction of the eye becomes more severe. Soon the eye takes on the same serious appearance that follows exogenous infection and with the same results.

Occasionally the infection is not so fulminating and it may subside, leaving a dense plastic exudate in the anterior chamber and usually in the vitreous chamber as well. These exudates shrink and result in phthisis bulbi. Rarely, however, the eye itself may be spared serious

damage and only a dense membrane in the anterior chamber be the final result. When this is cut the eye may regain useful vision.

Fortunately, postoperative endogenous infection is not common—in spite of the impossibility of eradicating all foci of infection, often because the eye itself has become the focal point of infection.[2] For this reason two cases in which good results were obtained in spite of severe postoperative infections are deemed worthy of report.

Case 1. T. S., a man, aged 81 years, came to the office (of D. K.) on January 4, 1943, because of progressive loss of vision for the past year. At present vision was so poor that he had to be led around. He had had diabetes for many years. About seven weeks prior to this visit he had developed an acidosis and was taken to a hospital where he remained for six weeks. During his stay at the hospital he lost 40 lbs. in weight and his diabetic condition was brought under control.

Examination revealed an almost mature cataract in the right eye and a mature cataract in the left eye.

The patient was admitted to the Brooklyn Eye and Ear Hospital for extraction of the lens of the left eye on January 5, 1943. A preoperative smear was negative for pathogenic organisms. On the same day, an attempt at an intracapsular extraction was made, but the lens could not be dislocated. The capsule was then incised with the cystitome and the lens expressed. Additional cortex was removed by irrigation. The wound was closed with two corneoscleral sutures, at the 2- and 10-o'clock positions. At the first dressing, two days later, the eye was white. On January 8, 1943, the eye was white and there was a small amount of cortex present. That night the patient was found under the bed, but the dressings were in place. On January 9th, a small amount of conjunctival secretion was observed. The eye was uncovered and sodium sulfathiazole solution, 5 percent every two hours, was instilled. The patient also was allowed out of bed.

On January 10th, the conjunctival secretion had disappeared, but the cornea around the lips of the wound was somewhat hazy and there was a slight amount of hypopyon in the lower anterior chamber. The eye was moderately injected. Sulfadiazine, gr. 15 every four hours for six doses, was ordered to be followed every four hours by gr. 7ss. of the drug. Two tablets of abdol, vitamin tablets, three times daily were also prescribed. On January 11th, the hypopyon did not seem greater and the eye appeared about the same. The next day, the hypopyon had increased to fill about half of the anterior chamber, and the eye felt soft to digital pressure. By the 14th, the anterior chamber was about three-fourths full with hypopyon and in addition there was an exudate in the upper part of the anterior chamber near the corneal section. Following this day the hypopyon seemed to decrease steadily. The patient refused to stay in the Hospital and was discharged on the 19th of January with a note that there was still an abundant amount of exudate in the anterior chamber but that it seemed to be receding. There was only a moderate amount of reaction in the eye.

During his stay at the Hospital the patient received a diet consisting of carbohydrates 150, proteins 60, and fats 110 gm. He also received 20 units of protamine zinc insulin before breakfast.

The patient was kept on sulfadiazine for a week after leaving the Hospital. The hypopyon kept receding, and a tendency to membrane formation was noted, so that by April, 1943, the eye was entirely white, and there was a dense mem-

brane extending from the lower pupillary border to the corneal section.

The patient was again entered at the Brooklyn Eye and Ear Hospital on April 29th, where a deWecker discission was performed. On May 24th, vision was 20/40 plus with a +11.00D. sph. ⊂ +2.00D. cyl, ax. 160°, and these glasses were prescribed.

Case 2. A. M., a man, age 74 years, was admitted to the Brooklyn Eye and Ear Hospital from the out-patient service of Dr. Hargitt, on October 5, 1943, with a mature cataract in the right eye.

Physical examination revealed a soft systolic murmur at the aortic area, a blood pressure of 140/80, deeply stained but noncarious teeth, and an aphakic left eye. The blood Wassermann and urine examinations were negative for pathologic changes, and the smear from the eye taken before the operation was negative for pathogenic organisms.

Preoperative procedure was carried out according to the Bell technique. O'Brien block and retrobulbar injections were given and an ample section was made. As the section was completed there was a slight bulging forward of the iris. It was thought, however, that this was not of such degree as to contraindicate extraction by the intracapsular method.

An iridectomy was done, the lens capsule was grasped at the lower pole, and slight pressure was exerted just inside the limbus in order to dislocate the lens. This maneuver was about completed when vitreous began to present. The intracapsular technique was then abandoned and the capsule ruptured with the cystitome. In attempting to remove the lens by pressure and counterpressure, the lens was dislocated into the vitreous chamber. The lens was spooned out with the Weber loop and although more vitreous was lost, the total amount was not excessive.

Three conjunctival sutures, previously prepared, were tied, no attempt being made to replace the iris pillars. A large air bubble remained in the anterior chamber. Atropine 1 percent, and metaphen 1:2,500 were instilled.

With the possible exception of the persistent air bubble in the anterior chamber, the postoperative appearance of the eye was not unusual until the fifth day. At this time it was noted that the entire cornea was becoming opaque and there was marked hyperemia of the entire conjunctiva. A diagnosis of postoperative endophthalmitis with hyalitis was made.

The appearance of the eye became progressively worse. On the ninth day, slitlamp examination revealed the cornea to be clear, and the gross appearance of the haziness was observed to be due to a gelatinous mass of grayish-green exudate in the anterior chamber, through which the iris could not be visualized. There was a small hypopyon in the bottom of the anterior chamber. On the 12th day, a small area of exudate in the upper border of the coloboma began to separate from the iris. Following this there was rapid recession of the inflammatory condition. Slitlamp examination on the 17th day showed the cornea to be clear. The iris structures were just visible. There was a membrane across the area of the coloboma which was believed to be lens capsule, and there was a large mass of yellow-green exudate in the vitreous. This vitreous exudate was rapidly absorbed so that on the 21st day there was only a small bead attached at the equator above the vitreous. At this time the patient was able to perceive the outlines of persons in good light at one-half meter.

The patient was discharged from the Hospital on the 26th postoperative day to be subsequently followed in the out-patient department.

Examination at this time showed many

vitreous floaters which seemed to consist of strands of exudate. There still remained a small bead of exudate at the equator above the vitreous, but this was much smaller than when previously observed. A fundus reflex could be obtained, but the details could not be made out. The conjunctival injection was disappearing and white sclera was beginning to show. The patient could count fingers if they were held above so that the patient could look through the upper part of the coloboma which was free of capsule.

The patient was again seen on November 11, 1942, at which time the vitreous exudate had completely disappeared and there were fewer vitreous floaters present. With a +10.00D. sph. ⊂⊃ +2.00D. cyl. ax. 105° he could distinguish features at 20 feet.

The patient was readmitted to the Hospital in April, 1943, and a discission performed. At present, except for some vitreous opacities, the fundus is negative for pathologic changes. Vision is 20/10+, and he is able to read and write.

Treatment in this case was rather vigorous in spite of the advanced age of the patient. When it was noticed, on the fifth postoperative day, that an intraocular infection was impending, an intravenous injection of 5,000,000 typhoid germs was given. This was repeated on the sixth, ninth, and eleventh days, with increasing doses of 10,000,000, 15,000,000 and 50,000,000 typhoid germs, respectively. The reactions were only moderate, the highest temperature obtained being 101.4°F.

At the same time, sulfathiazole, gr. 60 daily, was given until the 20th day. Hot compresses were started on the sixth postoperative day and were given three times daily for 20 minutes, followed by the instillation of atropine sulfate 1 percent. Two days later, the hot compresses were discontinued and infrared therapy was instituted. The lamp was used directly on the eye at a distance of 12 inches. In this way a maximum temperature was reached in eight minutes. This was sustained for 12 minutes longer.

On the 14th day, 10 c.c. of sterile milk was injected intramuscularly, and this was given daily for the next eight days.

In addition to all this, one drop of dionin 3 percent was instilled morning and night.

Discussion

The two cases here reported are similar only in the fact that they were late postoperative infections, probably of endogenous origin; other than that their similarity ends.

In case 1, the operative trauma was no greater than that incident to the average cataract extraction. The second patient undoubtedly had severe operative trauma. Whether such trauma is a direct cause of infection is questionable and difficult to decide. Yet it is our impression that the percentage of infections following severe or prolonged operative trauma is not great. An iritis or an iridocyclitis is more likely to develop. However, there can be no question regarding the fact that, in such a delicate organism as the eye, excessive trauma should be avoided. Greater attention must be paid to the choice of operation, and one should change the operative procedure as the indication arises, rather than persist in carrying out a preconceived plan of operation.

In spite of the more advanced age of the first patient and the obviously poor physical condition, the infection remained confined to the anterior chamber. In the second case, on the other hand, the vitreous chamber seemed to be involved to a greater exent. At no time, according to the operator (L. J. D.) was the hypopyon more than minimal in amount. The recovery seems all the more remarkable, as rarely does such a large vitreous exu-

date become absorbed so that useful vision is obtained.

Therapy likewise was radically different in each case. In case 1, only a sulfonamide in large doses and over a prolonged period of time was given. In case 2, in addition to a sulfonamide, a large variety of measures, some of them heroic, was tried.

In the past, such heroic measures, without the use of sulfonamides, were rarely attended with success. One must therefore give credit in these cases to the sulfonamides for the results obtained. Ophthalmology owes a great debt to the discoverers of these valuable drugs.

An interesting sidelight on the administration of the sulfonamides is that in old people large doses and prolonged use of these drugs are extremely well tolerated. Certainly with these drugs in the armamentarium a good deal of despair is avoided if one is unfortunate enough to get a postoperative infection of the eye.

861 Park Place, Brooklyn.
222 Union Street, New Bedford.

REFERENCES

[1] Fuchs, E. Textbook of ophthalmology. Ed. 8, Philadelphia, J. B. Lippincott Co., p. 92.
[2] Kravitz, D. Postoperative endogenous infections of the eye. Amer. Jour. Ophth., 1936, v. 19, April, no. 4, p. 328.

ESSENTIAL ATROPHY OF THE IRIS*

FRED MCK. RUBY, M.D.
Union City, Indiana

The present case of essential atrophy of the iris is presented for a double purpose. First the condition itself is rare enough to warrant reporting. Benedict—who with Henderson reported a case in 1940—has seen no other since the case reported by Barr and himself in 1934 (fig. 1). The second reason is that the condition was complicated by a "paper-dust" irritation of the cornea—somewhat common in packers at glass plants. The arrival at a decision as to just where the compensation stopped and the essential condition carried on presents a very nice problem.

To approach the case from its history, rather than its actual development, something should be stated about "paper-dust" irritation. During a year spent in Washington State, I had the opportunity to see many cases of "fir" poisoning. When a workman in the big mill would get a splinter in his hand or arm, especially if of some size, the swelling in 30 minutes would be enormous. Moreover, when the worker would forget "fir" sawdust, which often became caught in the cilia of his nares, and would grasp his nose to "blow hard," he often showed up in 30 minutes with a purplish nose about the

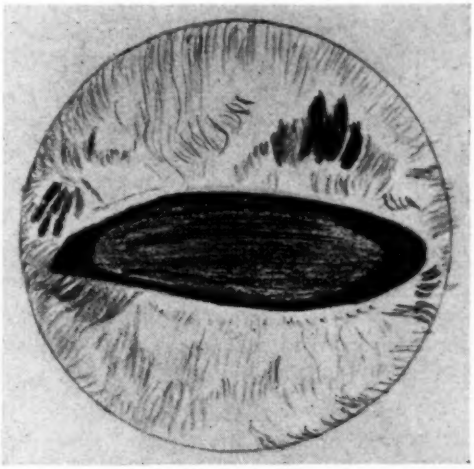


Fig. 1 (Ruby). Sketched from Henderson and Benedict's report of iris atrophy (Amer. Jour. Ophth., 1940, v. 23, p. 645).

*Read before the Indiana Academy of Ophthalmology and Otolaryngology, April 28, 1943.

size of a Bartlett pear, and be a sick man. Finally, when a small spicule of fir sawdust was incarcerated in the conjunctival sac or in the cornea, the swelling, epiphora, and discomfort were out of all proportion to the size of the foreign body, or its location. Many of these spic-

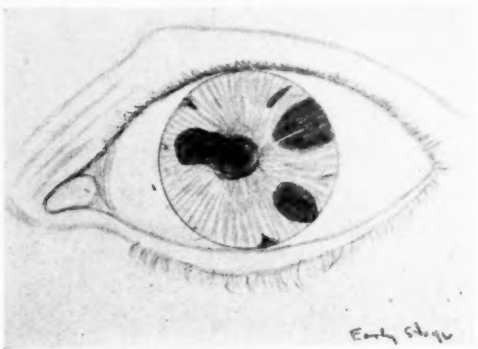


Fig. 2 (Ruby). The eye in the author's case —early stage, sketched from details given in the history.

ules were localized in the lid conjunctiva, upper or lower, by delicate palpation of the everted lid, not being visible by the naked eye. Removal of such particles, after being undiscovered for several days, would set up a reaction lasting as long as a week.

Now the pulp used in making the packing material to put between bottles or glass cans is a poorly cooked batch of fir waste products—often a whole batch of this material will be shipped with some still untreated fibers. Then these packers at the glass factory—frequently preceded by the men who unloaded the carload of pulp-paper—would begin to show up with typical fir-poisoned eyes. For two years, I was able to "date" a shipment of this kind.

As to the case to be reported: On November 15, 1941, Mrs. V. H., aged about 28 years, came to my office with the following history. In August she had a paper-dust condition in the right eye which was treated by a local physician. The eye had never become well. She had worked at intervals until the 19th of October, when she had to stop. Treatment by removal of dust and other measures seemed temporary, and she finally was sent to a specialist (fig. 2). He reported her trouble to be purely a condition of the eye and not compensable. She disagreed, went to another office and was told all previous treatments were wrong, as well as the diagnosis. Her condition still did not improve. It was then that she was sent to me, some 90 days after the accident. Her complaint at that time was that the eye was in an awful shape—"draws and burns and hurts *all* the time; waters almost continuously." Use of the eye caused much redness; headache was rather constant, worse around the right eye, requiring many resting tablets.

Examination of the right eye at this time showed very red external margins, the bulbar conjunctiva to be injected. The anterior surface of the cornea was hazy and Bowman's membrane rough, below, at the 5:30-o'clock position. The iris

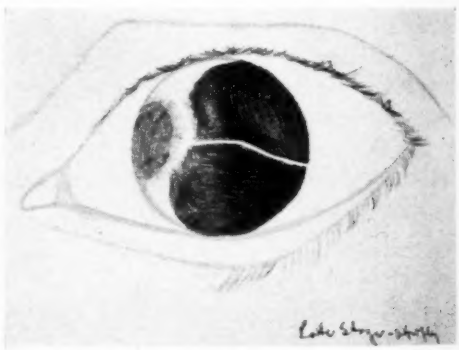


Fig. 3 (Ruby). Later development in the author's case, prior to enucleation.

seemed fixed and atrophied in several places. Tension was increased to fingers. Glasses obtained some months previous to incurrence of the disability gave no help.

The fundus showed little change and could be viewed through the distorted pupil as well as through two of the atrophic spots in the iris. During the next six weeks, repeated examinations showed variations in the haziness of the cornea, which, at times, would wrinkle ahead of the closing lids. Pontocaine ointment would give temporary relief to the symptoms. The vision and the headache were somewhat erratic. The tension was not improved.

In February, or 90 days after the patient had come under my observation, she went to Indianapolis for a visit and was referred to Dr. Masters for observation and treatment. She returned to me later in the spring with the condition unimproved. In June, the compensation question came to a head, for she had not worked since the previous October 19th. In the meantime, the colobomata in the iris continued to extend and enlarge so that a light held under the lower lid would give a beautiful picture of iris atrophy (fig. 3).

In August—settlement having been made out of court, in June, on the basis of 20 percent loss of vision—the patient decided to give up the eye, and it was enucleated on August 11, 1942 (fig. 4). Recovery was uneventful. The left eye has had absolutely no symptoms during the progress of the case.

PATHOLOGIC REPORT, as received from the Army Medical Museum.

Gross: The specimen consists of a partly collapsed eye measuring 24 by 25.5 by 23.5 mm. There are irregular thickening and opacity of the cornea and multiple colobomata of the iris. The eye is opened in the horizontal plane. The sclera is thin, the lens opaque, and the vitreous cloudy. The optic nerve is too short for cross section.

Microscopic: There is epidermalization of the corneal epithelium over a dense pannus. Bowman's membrane is rather thick and prominent and, immediately beneath it, there is scarring of the corneal lamellae. Descemet's membrane is thick peripherally. A peripheral anterior synechia obliterates the filtration angle. There is some cystoid degeneration of the pigment epithelium of the iris and of the

Fig. 4 (Ruby). Section of enucleated eye.

anterior ciliary body. On the temporal side, in the sections examined, only the anteriorly adherent peripheral portion of the iris remains, with pigment epithelium piled up on its posterior surface. On the nasal side there is a wide coloboma of the iris, and the pupillary portion shows ectropion uveae, vascularization behind the sphincter muscle, and loss of stroma in front of it. On this the stroma appears frayed at the margins of the coloboma. The lens does not appear to be desquamated. There is little hyalinization of the ciliary processes. The choroid is not remarkable. There are cystic degeneration of the retina at the ora serrata and slight edema of the outer plexiform layer at the macula, but otherwise significant changes are not seen in this coat. The lamina cribosa is depressed.

Diagnoses: Essential atrophy of the

iris; glaucoma, secondary: pannus degenerativus.

Comment

There are some 35 reports of cases of essential atrophy of the iris in the recent American literature. The condition is most often found in young adults, although others may have it. This may depend on the rapidity of its development. It is not a congenital condition, but progressive. Nor is it infectious, for in only one or two cases has it ever affected the second eye, and even these cases were not proved. The first authentic sign is a displacement of the pupil toward one side. This seems to result rather from atrophy on the opposite side than from excessive stimulation on the near side.

The cause of the atrophy has been much discussed. Some authorities considered glaucoma to be the cause, but the case of Barr and Fralick showed only a "24 point" reading on the Schiötz tonometer. The other theory points to a persistence of some of the embryonic activity in the eye—the process by which the hyaloid artery is destroyed, and the membrane dissolved in the pupillary area. Later in life, from some unknown cause, this process is reactivated, the atrophy, according to Casey Wood, seeming to start on the anterior surface of the iris, as the uveal layer often folds out over the edge of the coloboma. In a recent report glaucoma was considered to be the result of the atrophy. In the pathologic report of the eye, here described, there were adhesions from the base of the iris to the cornea, as well as some deposits of iris material about the periphery, shutting off the natural drainage from the eye. Other cases, however, showed no inflammatory condition, nor increase in white cells about any of the tissues. The final conclusions have been variously described as follows: de Schweinitz calls the condition an "abiotrophy or premature senility with death of cells." Kricker calls it "a combination of embryogenic cytolytic process of late development."

As to treatment of the case: Nothing except analgesics, local or general, seemed of the slightest value. When the eye was admittedly doomed, the greatest comfort was received by the local application of pontocaine and atropine. The latter was used upon the assumption that the "absolute-glaucoma" eye is painless, and this proved true in the eye, herein reported. The distress from light was relieved by a shield over the patient's glasses. Her vision dropped to 7/200 before enucleation. Following enucleation the refraction of the good eye was practically as it had been for two years. McKeown, in discussing treatment, states that whereas absolute glaucoma causes the blindness, it is secondary and not inflammatory; for the second eye practically always escapes.

As to the "paper dust" condition: The pathologic report showed that the cornea had been injured, at least once, maybe oftener. The "looseness" of Bowman's membrane—almost herpetiform in character—made the cornea more susceptible to the spicules of fir. The pannus could easily result from the repeated severe irritation.

Conclusions

1. The patient had "paper-dust" irritation.
2. She also had an underlying and previous essential atrophy of the iris.
3. The second condition made her suffering worse, and the duration longer.
4. While she would have suffered some, and would have lost the eye at approximately the same time, because of the atrophy, the reaction of the eye to the paper-dust irritation may have accelerated the other changes.

235 West Pearl Street.

References

Barr, A. S., and Benedict, W. L. Essential (progressive) atrophy of the iris. Arch. of Ophth., 1934, v. 12, Oct., pp. 567-570.

deSchweinitz, G. E. Essential progressive atrophy of the iris. Arch. of Ophth., 1927, v. 56, no. 1.

Fine, M. Essential progressive iris atrophy. Amer. Jour. Ophth., 1937, v. 20, March, p. 277.

Griscom, J. M. Essential atrophy of the iris. Amer. Jour. Ophth., 1927, v. 10, no. 9, pp. 647-649.

Henderson, J. W., and Benedict, W. L. Essential progressive atrophy of the iris. Report of a case. Amer. Jour. Ophth., 1940, v. 23, June, no. 6.

Jeancon, E. Progressive essential atrophy of the iris. Amer. Jour. Ophth., 1933, v. 16, Sept., pp. 813-814.

McKeown, H. S. Essential progressive atrophy of the iris. Arch. of Ophth., 1937, v. 18, Sept., pp. 347-351.

Post, M. H. Essential progressive atrophy of the iris. Amer. Jour. Ophth., 1939, v. 22, July, pp. 755-760.

Rones, B. Essential atrophy of the iris. Amer. Jour. Ophth., February 1940, v. 23, Feb. pp. 163-171.

Waite, J. H. Essential progressive atrophy of the iris. Amer. Jour. Ophth., 1928, v. 11, March, pp. 187-191.

Yao, F. H. Atrophy and separation of the anterior stroma layers of the iris. Chinese Med. Jour., 1935, v. 50, Oct., pp. 1421-1422.

THE GEOGRAPHICAL DISTRIBUTION OF OCULAR INFECTIONS*

With special reference to tropical and subtropical countries

Charles Weiss, M.D.
San Francisco

Experience has shown that it is important to become familiar with the distribution of infectious diseases in the active combat zones of the war. While McKinley's work on "A geography of disease"[1] and Mumford and Moore's "Preliminary report on parasitic and other infectious diseases of the Japanese mandated islands and Guam"[2] cover the subject of transmissible diseases in general, they contain very little information on infections of the eye. As observed by Lindner[3] and others during the first World War, epidemic and endemic diseases of the eye may produce a high noneffective rate among armed forces.

Conjunctival infections are very common in tropical and subtropical countries "because of the presence of excessive heat, dust, and sunlight; crowding, filth, and lack of water; malnutrition and vitamin deficiencies. To these factors may be added the enormous number of flies and other insects, and the superstitious customs prevalent among the indigenous population."[4]

In table 1 the most important infectious diseases of the eye are arranged according to broad geographical zones, since it was impossible to obtain more specific information from the literature.[5-10]

*From the Laboratory for Ophthalmic Research, Mount Zion Hospital. Aided by a grant from the Columbia Foundation.

TABLE 1

GEOGRAPHICAL DISTRIBUTION OF OCULAR INFECTIONS

1. NORTH AFRICA (TUNIS, ALGERIA, EGYPT, ABYSSINIA, AND MOROCCO) AND WEST AFRICA

Virus diseases: trachoma, punctate keratitis, yellow fever (produces subconjunctival hemorrhages—West Africa); smallpox (blindness).

Bacterial diseases: acute conjunctivitis due to Pneumococcus or Koch-Weeks bacillus ("pink-eye"); frambesia tropica (yaws); recurrent fever (iritis, iridocyclitis, choroiditis); syphilitic keratitis; gonorrheal ophthalmia; angular conjunctivitis due to Morax bacillus; leprosy; *M. tuberculosis;* plague (corneal ulcers, iritis, iridocyclitis); gonorrheal ophthalmia.

Parasitic infestations: D. latum (Sparganum mansoni); filariasis (F. loa-loa—West Africa); trypanosomiasis (causes keratitis, purulent conjunctivitis, iritis, iridocyclitis, inflammation of eyelids).

Flies and Insects (Myiases): Ant stings; worm similar to screw worm.

2. MADAGASCAR

Virus diseases: trachoma.

Bacterial diseases: syphilitic keratitis; "ulcus serpens" (Pneumococcus); leprosy; tuberculosis.

Fungus diseases: aspergillosis (corneal ulcer).

Miscellaneous: phlyctenular kerato-conjunctivitis.

3. CHINA, INDIA, AND INDO-CHINA

Virus diseases: trachoma; Samoan (inclusion) conjunctivitis; epidemic punctate keratitis (Ceylon, Madras, Bengal); smallpox (Madras, Ceylon, Cochin).

Bacterial diseases: acute conjunctivitis ("pink-eye"—Cochin, Bombay, Madras); gonorrheal ophthalmia (adults); conjunctivitis due to Morax bacillus; conjunctivitis due to Staphylococcus, Pneumococcus; blennorrhea neonatorum (Gonococcus); recurrent fever (iritis, iridocyclitis, choroiditis); plague (corneal ulcers, iritis, iridocyclitis—Madras, Ceylon, Cochin); syphilitic keratitis (Hanoi); "ulcus serpens" (Pneumococcus); leprosy; tuberculosis; frambesia tropica (yaws—Ceylon).

Fungus diseases: Polyps on conjunctiva due to *Rhinosporidium seeberi* (Madras, Ceylon, Cochin); *Rhinosporidium kinealyi* on lid (Madras, Ceylon, Cochin).

Parasitic infestations: D. latum (Sparganum mansoni—China, Annam, Tonkin); filariasis (China, Annam); blinding filariasis (Bombay, Madras); Kala-azar (L. donovani—Central China, Peiping); *T. solium* (cysticercus—China); echinococcus granulosus of orbit (China).

4. DUTCH EAST INDIES AND MALAYA

Virus diseases: trachoma; punctate keratitis; smallpox.

Bacterial diseases: acute conjunctivitis ("pink-eye"); conjunctivitis due to Staphylococcus, Pneumococcus (Java); conjunctivitis (Morax bacillus—Kuala-Lumpur); diphtheritic conjunctivitis; blennorrhea (Gonococcus) in adults; blennorrhea neonatorum (Gonococcus); serpiginous ulcer (Pneumococcus); tuberculous iritis; frambesia tropica (yaws); plague (Singapore); syphilitic keratitis; leprosy.

Fungus diseases: conjunctivitis due to yeasts (Java).

Parasitic infestations: Filaria bancrofti (elephantiasis of eyelids—Sumatra); leeches in conjunctiva.

Flies and Insects (Myiases): Buffalo louse in conjunctiva.

5. SOUTH PACIFIC ISLANDS (INCLUDING SAMOA AND HAWAII)

Virus diseases: Samoan (inclusion) conjunctivitis (Tonga, Fiji group, Savaii, Manua, Samoan archipelago); vaccinial infections of lids; epidemic keratoconjunctivitis (Hawaii).

Bacterial diseases: Frambesia tropica (yaws) Ellice and Tokelau Islands; conjunctivitis due to Morax bacillus (British East Indies); tuberculosis (Ellice and Tokelau Islands); leprosy; syphilis; catarrhal conjunctivitis with corneal ulcer (Ellice Islands).

Fungus diseases: conjunctivitis due to yeasts.

Parasitic infestations: filariasis of eyelids (Ellice and Tokelau Islands).

6. JAPAN AND MANDATED ISLANDS

Virus diseases: trachoma; lymphogranuloma venereum; inclusion conjunctivitis (Saipan).

Bacterial diseases: oculo-glandular tularemia; leprosy; tuberculosis.

Fungus diseases: Aspergillus fumigatus (kerato-mycosis).

Parasitic infestations: D. latum (*Sparganum mansoni*) in conjunctiva and eyelids; leeches in conjunctiva.

Flies and Insects (Myiases): akamushi tick (carrier of tsutsugamushi virus) may bite eyelids.

7. Australia, New Zealand, and Tasmania

Virus diseases: epidemic keratoconjunctivitis; Samoan (inclusion) conjunctivitis; trachoma.
Bacterial diseases: leprosy; tuberculosis.
Parasitic infestations: D. latum (*Sparganum mansoni*) causes tumor of eyelids.

8. Palestine, Syria, and Turkey

Virus diseases: trachoma; pappataci fever.
Bacterial diseases: acute conjunctivitis ("pink-eye") due to Pneumococcus and Koch-Weeks bacillus, conjunctivitis and keratitis due to the Morax bacillus; gonorrheal blennorrhea; leprosy; tuberculosis.
Parasitic infestations: leishmaniasis; malaria.
Flies and Insects (Myiases): sand flies.

9. Mexico, Central America, and Caribbean Islands

Virus diseases: trachoma; yellow fever (subconjunctival hemorrhage); typhus fever.
Bacterial diseases: "pink-eye," acute conjunctivitis due to Koch-Weeks bacillus (Colombia); recurrent fever (iritis, iridocyclitis, choroiditis); frambesia tropica (yaws—West Indies, Cuba); leprosy; tuberculosis.
Parasitic infestations: filariasis ("blinding filaria"—Guatemala, Mexico, Cuba).
Flies and Insects (Myiases): flies (Costa Rica, Colombia, Puerto Rico, Mexico); ant stings (Puerto Rico).

10. South America

Virus diseases: trachoma; yellow fever (causes subconjunctival hemorrhage—Brazil).
Bacterial diseases: frambesia tropica (yaws); plague (corneal ulcer, iritis, iridocyclitis—Brazil); leprosy; tuberculosis; "pink-eye" (Koch-Weeks bacillus—Brazil).
Fungus diseases: Rhinosporidium seeberi (conjunctival cysts); actinomyces. *Aspergillus niger* causes "sapiranga" in Brazil.
Parasitic infestations: Leishmanian keratitis (Brazil); edema of lids from Trypanosoma cruzi (Brazil); echinococcus granulosus (Brazil, Argentina); *T. solium* (cysticercus—Argentina, Brazil); D. latum (Sparganum mansoni—British Guiana).
Flies and Insects (Myiases): Screw worms (gold bottle fly—French Guiana).

2200 Post Street.

References

[1] McKinley, E. B. A geography of disease. Washington, D.C., George Washington University Press, 1935.

[2] Mumford, E. P., and Mohr, J. L. Background to post-war reconstruction. Part I. Preliminary report on parasitic and other infectious diseases of the Japanese mandated islands and Guam. Amer. Jour. Trop. Med., 1943, v. 23, p. 381.

[3] Lindner, K. Ueber eine Endemie von 56 Gonoblennorrhöen. Klin. M. f. Augenh., 1920, v. 65, p. 637.

[4] Weiss, C. Laboratory aids in the diagnosis of infections of the eye prevalent in tropical and subtropical countries. In press.

[5] Bakker, C. Augenkrankheiten in den Tropen. In Kurzes Handbuch der Ophthalmologie, Berlin, Julius Springer, 1932, v. 7, p. 472.

[6] Elliot, R. H. Conjunctivitis in the tropics. Brit. Med. Jour., 1925, v. 1, p. 12.

[7] Motais, F. Les maladies des yeux dans les pays chauds. In Maladies chirurgicales et oculaires aux colonies. Service de Santé des Expeditions Coloniales, 1922, v. 8, p. 249.

[8] Dowden, R. Annual Report of Medical Department for 1927, Federated Malay States, 1928, Appendix L., p. 137.

[9] Feigenbaum, A. Hornhautkomplikationen bei der in Palästina epidemisch vorkommenden Koch-Weeks Konjunktivitis. Klin. M. f. Augenh., 1921, v. 67, p. 436.

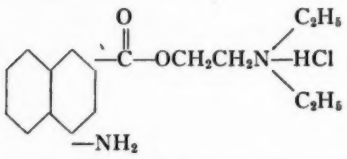
[10] Manson-Bahr, P. H. Manson's tropical diseases. Baltimore, William Wood & Co., 1936.

NOTES, CASES, INSTRUMENTS

THE USE OF NAPHTHOCAINE AS A LOCAL ANESTHETIC IN OPHTHALMOLOGY

ROY ALLEN STEWART, M.D.*
Baltimore

Naphthocaine[1, 2] is the mono-hydrochloride of beta-diethylaminoethyl ester of 4-amino-1-naphthoic acid. Its structural formula is as follows:



It is a yellowish crystalline material soluble up to 2 percent in distilled water, making a clear pale-yellow solution with a pH of about 4.4. The solutions used for this clinical study contained sodium bisulfite, chloretone, and adrenalin 1:50,000; the naphthocaine† was 0.2-percent, 0.3-percent, and 1.0-percent. The 0.3-percent and 1.0-percent solutions were superior in their anesthetic properties to the 0.2-percent solution, but even the 0.2-percent solution was superior to procaine. I could not discern any difference in the anesthetic properties between 0.3-percent naphthocaine and 1.0-percent naphthocaine.

When 4-percent cocaine instillations and 5.0 c.c. of 2-percent procaine injections are used as a local anesthetic in intraocular surgery there appear to be definite disadvantages. When the superior-rectus suture is placed the patient usually has a definite pain. Likewise there is pain when an iridectomy is performed. Akinesia is often faulty. Postoperatively, the patient often has pain in the eye that has been operated on within a few hours or less time.

When 4-percent cocaine instillations and 5.0 c.c. of 0.3-percent naphthocaine injections are used in intraocular surgery there is usually no pain when the superior-rectus suture is placed, and no pain when an iridectomy is done. Akinesia is really excellent. The average length of time before postoperative pain begins is 8 to 10 hours.

At the Baltimore Eye, Ear, and Throat Hospital we have made a clinical study of naphthocaine as a local anesthetic in ophthalmology. The following list of operations under this anesthetic have been performed:

	Number of Cases	Amount Injected	Instillations
		c.c.	
Intracapsular cataract extraction	20	5.0	4% cocaine
Iridectomy	1	5.0	4% cocaine
Iridencleisis	3	5.0	4% cocaine
Lagrange anterior sclerectomy	1	5.0	4% cocaine
Posterior sclerotomy	1	1.0	4% cocaine
Walker operation for retinal detachment	2	8.0	4% cocaine
Enucleation	1	8.0	4% cocaine
Suture of lacerated lids	1	5.0	4% cocaine
Lacrimal probing	5	1.0	4% cocaine
Reese resection and Jameson recession	1	5.0	4% cocaine
Curretment of chalazia	15	0.5	0.5% pontocaine
Conjunctival plastic for symblepharon	1	2.0	0.5% pontocaine
Kuhnt-Szymanowski operation for ectropion	1	13.0	0.5% pontocaine

* From the Baltimore Eye, Ear, and Throat Hospital.

† The naphthocaine was supplied by courtesy of Parke, Davis, and Co.

The striking features of local anesthesia with naphthocaine are its immediate anesthetic effect after injection, the excellent akinesia, the real anesthesia during the operation, and the long duration of the anesthesia. The Walker operation is a real test of a local anesthetic. In the two cases reported the patients complained of no pain during the operation and required only codeine 0.5 gr. and 10 gr. of acetylsalicylic acid 10 hours postoperatively. When this procedure was carried out with procaine the patient was rather uncomfortable and the postoperative pain somewhat severe.

Although naphthocaine works best when injected it has a good anesthetic effect upon instillation, and corneal foreign bodies can be removed, tonometry and other minor procedures can be effected without pain to the patient. When naphthocaine is injected into the lacrimal sac by way of the canaliculus, lacrimal probing can be done with very little discomfort to the patient. In the cases reported no patient developed toxic symptoms,[3-5] nor any appreciable change in pulse, respiration, or blood pressure. The Nose and Throat Department has used 30.0 c.c. of naphthocaine for injection many times and there has been no reaction to the drug.

From this small experience with naphthocaine it would seem to be the best drug for obtaining local anesthesia in ophthalmology.

5802 Edmondson Avenue.

References

[1] Blicke, F. F., and Parke, H. C. Alkylaminoalkyl esters of aminonaphthoic acids as local anesthetics. Jour. Amer. Chem. Soc., 1939, v. 61, p. 1200. Jour. Amer. Chem. Soc., 1940, v. 62, Dec., p. 3316

[2] Rowe, L. W. Local anesthetic action of some aminonaphthoic acid esters. Jour. Amer. Pharm. Assoc., 1940, v. 29, June, p. 241.

[3] Haury, V. G., Gruber, C. M., and Drake, M. E. The toxicity, anesthetic potency, and some pharmacological actions of a new local anesthetic beta-diethylaminoethyl ester of 4-amino-1-naphthoic acid (naphthocaine). Jour. Pharm. Exp. Therap., 1940, v. 70, Nov., p. 315.

[4] Rose. Anesth. and Analg., 1931, v. 10, p. 159.

[5] McIntyre and Sievers. Jour. Pharm. Exp. Therap., 1937, v. 61, p. 107.

NOMINAL DUCTION AND TRUE DUCTION POWER

Joseph I. Pascal, M.D.
New York

One of the striking points in Abraham's article on "Near horizontal phoria and duction tests" in the March, 1943, issue of the American Journal of Ophthalmology is the wide discrepancy in the adduction-abduction ratio at near in the normal group as found by him and as found by Berens *et al.* in their investigation. The latter found a ratio of practically 2:1 of adduction to abduction, while Abraham found a ratio of practically 1:1. However, these results may not be so far apart as they seem if we take into consideration the difference between nominal ductions and true ductions. Nominal ductions refer to the amount of prism power, base out or base in, overcome without reference to an existing phoria; true ductions refer to the amount of prism power, base out or base in, overcome but with reference to an existing phoria. True duction power measures what has been called breadth of fusion and refers to a forced movement of the eyes inward or outward in order to maintain or regain single binocular vision.

To take case 1, table 1, as an instance. This patient had 6 delta of exophoria (I prefer the short term delta to the clumsy term prism-diopter). The nominal abduc-

tion was 20 delta. But the first 6-delta prism, base in, did not induce a *forced* movement outward in order to maintain fusion. It permitted a relaxation of 6 delta to the position of equilibrium. Beyond the 6 delta the base-in prism produced a forced outward rotation in order to maintain fusion. This amounts to 14 delta, which represents the true abduction.

The nominal adduction in this case was 19 delta. But the patient began the test with a forced inward rotation, a true adduction of 6 delta, to compensate for his 6 delta of exophoria. Therefore the total true adduction was 25 delta. The ratio of adduction to abduction is as 25:14, nearly 2:1. If the amount of exophoria is added to the adduction and subtracted from the abduction, the ratio in most of the cases will be nearly 2:1. The fact that Berens's findings were made at a closer range, at 25 cm. to Abraham's 33 cm., may account for the somewhat greater relative adduction in the former set. At the closer point, the sense of nearness may be more effective in inducing the convergence activity.

37 West Ninety-seventh Street.

SOCIETY PROCEEDINGS

EDITED BY DR. DONALD J. LYLE

NEW YORK SOCIETY FOR CLINICAL OPHTHALMOLOGY

October 5, 1942

DR. ISADORE GIVNER, *presiding*

STANDARDIZATION OF THE SCHIÖTZ TONOMETER

DR. ADOLPH POSNER presented an exhibit and demonstration on this subject during the instructional hour.

DISASSOCIATION OF THYROTOXICOSIS AND OPHTHALMOPATHY IN GRAVES'S DISEASE

DR. SAUL HERTZ stated that there are cases in which no correlation between the degree of ophthalmopathy and the degree of thyrotoxicosis in Graves's disease exists. Low degrees of thyrotoxicosis may exist with serious ophthalmopathy, and vice versa. Cases of serious eye disturbances require special handling both from the diagnostic and therapeutic point of view and must be considered apart from the ordinary cases of Graves's disease. The eye disturbances often improve with iodine therapy, but the best results have been obtained with iodine and thyroid. Occasionally it has been necessary to add X-ray treatment to the thyroid. Thyroidectomy is definitely contraindicated in this type of case.

A recent survey by Dr. J. H. Means has indicated that, in a group of representative clinics, thyroidectomy preceded the orbital decompressions in over 90 percent of cases requiring orbital decompression. On the other hand, no orbital decompressions have been performed at the Massachusetts General Hospital Clinic for three years since the institution of the present policy of averting thyroidectomy in cases suspected of being in the special group of ophthalmopathic Graves's disease.

Pictures were shown to illustrate the difference between cases of the ordinary type of Graves's disease and those of the progressive or malignant exophthalmic type.

Discussion. Dr. Maurice Bruger stated that Dr. Givner and he had studied the effect of vitamins B_6 and E in eight patients with postthyroidectomy exoph-

thalmos. These vitamins were chosen because of their recognized value in some forms of muscular dystrophy. It was thought that there might be some influence on the myopathic changes in the extraocular muscles, the prime factor in the causation of exophthalmos. In addition, three patients were given ergotamine tartrate and one prostigmine bromide. Vitamins B_6 and E were without effect on the degree of exophthalmos or on the extent of the lid retraction. Ergotamine tartrate, however, improved the Dalrymple sign appreciably without altering the exophthalmos. Prostigmine bromide was without measurable effect.

Dr. Daniel Kravitz asked Dr. Hertz how he accounted for the exophthalmos when the ocular muscles were not enlarged.

Dr. H. M. Katzin asked Dr. Hertz to enlarge on the subject of treatment of malignant exophthalmos with X-ray therapy to the thyroid gland.

Dr. Hertz, in closing, said that from the medical point of view, it seems not unbelievable that one could have edema of the orbital tissues and that the muscles need not necessarily be involved. He cautioned that one has to be very strict in placing the patient in the category of malignant exophthalmos. His experience with X-ray treatment has been limited. It has been effective in a few cases in which iodine and thyroid therapy did not fully control the condition.

Surgical procedures for exophthalmos in hyperthyroidism

Dr. Edmund B. Spaeth stated that the surgical treatment of exophthalmos from thyrotoxicosis depends upon the degree of exophthalmos present, the rapidity of its progress, and the period at which it appears as a surgical situation, such as the stationary exophthalmos of thyrotoxicosis (regardless of whether or not a thyroidectomy has been done), and that type of exophthalmos which follows after a thyroidectomy.

Other complications, such as oculomotor disturbances, retraction of the upper lid, conjunctival edema, and an endangered cornea from lagophthalmos are all additional factors, frequently of serious import. It is these complications, as they appear, that control the seriousness of the condition being treated; also they decide, to a very large extent, the type of surgery that is necessary in any given case.

Malignant or progressive exophthalmos can be treated successfully only by some type of orbital decompression. The subzygomatic route for this, it seems, is as satisfactory a procedure as is the transfrontal approach for the removal of the roof of the orbit. Anatomically there should be no choice between the two when considering this type of exophthalmos.

Discussion. Dr. John H. Dunnington stated that operations done for cosmetic reasons are often disappointing to the patient. They expect too much in spite of our efforts to depict the true picture to them. He has, therefore, been inclined to operate only when the lagophthalmos or other symptoms demand action. Recession of the levator as described by Goldstein will remove the disfigurement caused by retraction of the upper lid, and in his opinion its use should be restricted to cases manifesting a marked exposure of the sclera above the upper corneoscleral margin. Lateral tarsorrhaphy narrows the palpebral fissure satisfactorily, and he believes the best technique is that described by Wheeler. In this operation a tongue of tarsus denuded of its epithelium is inserted into the opposite lid. This operation gives an acute angle to the external canthus and is far superior to the rounded one that follows after the use of the Fuchs technique.

The selection of the lid from which the tongue is to be carved will depend upon whether one wishes primarily to lower the upper lid or to raise the lower lid. A tongue from the upper lid inserted into the lower lid narrows the fissure chiefly by lowering the upper lid, while the reverse is true when the tongue is taken from the lower lid and inserted into the upper lid.

Intermarginal adhesions afford the necessary protection for the cornea in cases of lagophthalmic keratitis and should be inserted prior to the onset of extensive chemosis of the conjunctiva and edema of the lids. In his experience retrobulbar drainage for a prolapsed chemotic conjunctiva has not been necessary. Gentle massage with a glass spatula combined with liberal use of an antiseptic ointment has proved sufficient in the majority of instances.

Orbital decompression for progressive exophthalmos in thyroid disease

Dr. James L. Poppen recounted surgical experiences in relation to orbital decompression for progressive exophthalmos in a series of 25 consecutive cases at the Lahey Clinic. He stated that there is an optimum time for the operation and that it should not be withheld until the development of chemosis and perhaps corneal ulceration. Indications for the procedure consist of progressive exophthalmos of high grade together with progressive visual symptoms and often changes in the optic-nerve head. The operation is not serious and, in his experience, there is no operative mortality. The technique of the Naffziger operation with slight modifications was described.

Procrastination is to be deprecated when visual loss is detected, inasmuch as all other palliative treatment has been of no effect. The only possible exception seems to be the preoperative determination of the basal metabolic rate, in order to determine whether Lugol's solution and possible excision of thyroid remnants should be considered.

The symptom of diplopia in relation to extraocular palsies should receive attention. While such a condition may persist to some degree or possibly result from the operation, it is usually amenable to minor operative treatment in those cases that do not clear up spontaneously. Following the operation there is immediate postoperative improvement in the exophthalmos and a gradual recession usually continues over a period of years.

Discussion. Dr. Howard Naffziger described the characteristic pathologic changes found in the ocular muscles in malignant exophthalmos. He emphasized the points that the condition of the muscles in the ordinary cases of exophthalmic goiter is not known and that muscle changes are not necessarily the same in cases of malignant exophthalmos. He described his technique of orbital decompression and stated that a broader exposure can be obtained than with the subzygomatic approach. One reason for confusion as to the presence or absence of exophthalmos has been failure to distinguish "stare," or retraction of the upper or lower lid, from protrusion of the eyeball. Exophthalmos can be confirmed only by careful measurement with the Hertel exophthalmometer. Unilateral exophthalmos speaks for orbital neoplasm, rather than thyroid disease. Soley has found that eyes of more than 50 percent of patients with toxic diffuse goiter became measurably more prominent after thyroidectomy, contrary to the clinical impression of most clinicians.

Dr. Martin Cohen stated that he regarded the Naffziger operation formidable and that he has obtained the same results with the Krönlein operation.

Jesse M. Levitt,
Secretary.

CHICAGO OPHTHALMOLOGICAL SOCIETY

October 19, 1942

DR. LOUIS G. HOFFMAN, *president*

CLINICAL PROGRAM

(Presented by the staff of Children's Memorial Hospital)

SCIENTIFIC PROGRAM

THE PROBLEM OF RATING AMETROPIC VISUAL ACUITY

DR. JAMES O. LEBENSOHN presented a paper on this subject.

Discussion. Drs. Kronfeld, Jaeckle, and Lebensohn participated.

SURGERY OF THE OBLIQUES

DR. SANFORD R. GIFFORD read a paper on this subject.

Discussion. Drs. Mayer, Kronfeld, H. J. Smith, Selinger, and Gifford were the discussers.

Robert Von der Heydt.

COLORADO OPHTHALMOLOGICAL SOCIETY

October 24, 1942

DR. GUY HOPKINS, *presiding*

TREATMENT OF CATARACT WITH LYMPHOGOGUES

DR. EDWARD R. NEEPER presented L. M., a woman, aged 42 years, who was first seen in February, 1937. She gave a history of failing vision in the right eye for the past 15 months. She also complained of having had eczema all her life and showed definite signs of allergy. The vision at that time was R.E. 20/200; L.E. 20/20−4. Vision was unimproved with lenses. The right lens was cataractous throughout. The left lens had a posterior polar cataract about 2 mm. in diameter. Lymphogogues have been used once each week since that time. On July 8, 1942, examination showed that the right eye had a mature cataract, but the left lens had remained stationary.

Dr. Neeper also presented the case of C. M. who had been under observation for a period of over 25 years. In 1933 she showed beginning cataracts, more marked in the left eye. Lymphogogues were started in November, 1934, and used once each week since that time. At this time vision, with correction, was normal.

REMNANTS OF THROMBOSIS OF CENTRAL RETINAL VEIN, RIGHT EYE

DR. FRITZ NELSON said that J. J. S., a man aged 53 years, complained of sudden loss of vision, right eye, two years ago. There was, however, partial return of vision. The left eye had always been normal. Examination showed remnants of a thrombosis of the central retinal vein, right eye, with the formation of a large number of collateral vessels on the surface of the disc. The patient had had difficulty in swallowing, especially cold foods, for many years.

X-ray examination showed a large diverticulum of the esophagus. It was suggested that there is a causal connection between thrombosis of the central retinal vein and the diverticulum, owing to compression. On the other hand frequent exposure to carbon monoxide may be a contributing factor in the cause of thrombosis.

TUMOR OF OPTIC NERVE

DR. FRITZ NELSON presented R. C. E., a woman, aged 43 years, who was first seen in April, 1942, with a brown, tumor-like mass, semispherical in shape, covering the upper nasal third of the disc in the right eye and extending into the adjacent area. There was suspicion of a slowly growing malignant melanoma. No treatment was advised for the present, but close observation was recommended.

Contact lenses

Dr. Fritz Nelson said that C. A. J., a man, aged 47 years, had a pronounced keratoconus in both eyes. He was fitted with aspheric contact lenses in June, 1941, and since that time has been able to continue his occupation as a sheet-metal worker very satisfactorily.

Cataract extraction with complications

Dr. Fritz Nelson presented L. S. S., a man, aged 58 years, who had had a cataract extraction, right eye, in August, 1940, with uneventful recovery. The left eye was operated on without iridectomy on August 4, 1942; there were no complications. He was released from the hospital August 12, 1942. An iritis developed on August 15th, followed by secondary glaucoma, which did not respond to treatment. On August 31st there was beginning panophthalmitis, with exophthalmos and chemosis. An Elliot trephining was performed on August 31st. A culture of the chamber fluid showed pure Staphylococcus aureus. Immediate medication was instituted, with sulfathiazole grams 4 as an initial dose, and grams 1.5 every four hours. There was complete recovery within three weeks.

New growth

Dr. Von H. Brobeck said that L. B. C., a man, aged 61 years, gave a history of redness and new growth on the right eye of three years' duration. During this past summer there was some pain in the eye and blurring of vision. Examination revealed an irregular triangular growth on the temporal episclera which invaded the cornea over its outer third, with vascularization. Biopsy report showed an incipient basal-cell carcinoma.

Discussion. Dr. E. M. Marbourg remarked that clinically it resembled pemphigus.

Isolated paresis of the superior oblique

Dr. George H. Stine and Dr. K. H. Chapman presented J. A. W., a man, aged 57 years, seen for the first time in September, 1942, with a history of having fallen from a ladder and striking the back of his head and shoulders. Diplopia was noticed immediately after the accident. External examination of the eyes was negative, except for left hyperphoria, with the deviation greatest on looking down and to the right, the left eye lagging slightly. There was a slight increase in the deviation when fixating with the left eye. Measurement of the deviation with the Lancaster red-green test showed about three arc degrees of vertical deviation in the primary position, with the deviation greatest in the lower right field, the left image also being tilted down and to the left. The fundus was normal in each eye. Examination revealed no other physical injuries. The patient was placed on potassium iodide, 10 drops, three times a day, and the left eye was occluded to avoid diplopia. In three months the patient complained of practically no double vision except when his head was tilted far backward. The vision was 1.3 in each eye.

Dr. Stine and Dr. Chapman reported another case, a man, aged 48 years, with a bilateral fourth-nerve paresis, following a kick in the head by a horse. The condition cleared up in four months' time.

The third case was that of a man, aged 51 years, who also fell from a ladder. He showed a slight paresis of the left superior oblique which was much improved in one month's time.

The fourth case was observed in a woman, aged 63 years, who developed diplopia suddenly one day. She showed symptoms of hypertension and arteriosclerosis. Examination of the ocular rotations and diplopia fields indicated paresis

of the right superior oblique, the diplopia increasing when the head was tilted to the right, whereas single vision was obtained on tilting the head to the left. There was considerable improvement in the diplopia in one month's time under potassium-iodide medication.

Dr. Stine pointed out the value of the head-tilting test after the method of Bielschowsky, which when positive was pathognomonic of superior-oblique involvement. This test could be done with the hand stereoscope held tightly to the face and rotated with it, using a horizontal line on a test card, half of which was green and the other half red, to identify it with the right and left eye, respectively.

Glaucoma and Uveitis

Dr. George H. Stine said that J. P., a woman, aged 50 years, who had been under his care since December, 1941, complained of blurred vision of the left eye which had definitely become worse the past two weeks, accompanied by some deep pain. The vision of the right eye was also blurred. She had had some badly infected teeth extracted two weeks previously and had also been treated for a mild sinusitis.

The right eye showed a low-grade uveitis with a few gray keratitic precipitates, a few pigment deposits in the pupillary margin, a few cells in the aqueous, and some fine dustlike opacities in the vitreous. The fundus was otherwise negative.

The left eye was in a state of advanced simple glaucoma. There was no evidence of a uveitic process, now nor previously, in this eye. There was some glaucomatous atrophy and cupping of the disc.

The tension of the right eye had never been found to be above 26 mm. Hg (new Schiötz). The tension of the left eye was 65 mm. Hg (Schiötz) but was reduced to 23 mm. Hg by the use of pilocarpine and eserine. However, this reduction was not maintained. The field of vision in the left eye showed a severe concentric contraction. The right visual field was normal. Iridencleisis was done on the left eye in December, 1941, with an excellent result, although the vision was not improved beyond the ability to detect hand movements at one meter. The vision of the right eye when first seen was 0.9 but was now reduced to 0.4. The general physical examination, including tests for syphilis and undulant fever, revealed no pathologic changes. The intradermal tuberculin test was positive to 0.005 mg. tuberculin. The patient has been under treatment with increasing doses of tuberculin; instillations of dionin and atropine; several intravenous injections of typhoid H antigen, dosage up to 60 million; Pregl's iodine packs; and Reese paracentesis, which have controlled the condition but little to date. Mild X-ray therapy to the eye was being instituted.

Walter A. Ohmart,
Secretary.

LOS ANGELES SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

October 26, 1942

Astigmatic Determinations—A Clinical Comparison of Methods

Dr. Julian Ginsberg gave a summary of the astigmatic tests commonly used by ophthalmologists, with the conclusion that there is no universal astigmatic test for all problems in refraction and therefore all methods should be understood and combined for the best results.

Modified Ptosis Operation (with films)

Dr. Orwyn Ellis presented a procedure for the correction of ptosis based on the Motais's operation which was published in the proceedings of the

Pacific Coast Oto-Ophthalmological Society, 1942; also in this Journal (1943, October).

Cyclodiathermy in glaucoma

Dr. Clarence H. Albaugh said that until recently successful glaucoma surgery was based on the conception of increasing the adequacy of aqueous escape. Furthermore, there was no advance of a major proportion in the type of surgery done in the past decade. Our obscure knowledge of the basic cause of glaucoma was to a great extent responsible for this situation. Also, it was as yet impossible to produce typical chronic simple glaucoma in laboratory animals and thus much of the surgical experimental work was limited to the human being. The idea of cutting down the amount of aqueous formed was by no means a new one; however, the means of doing such a thing safely was not in current use until relatively recently. Since the diathermy had become available and had been tested on the eye in procedures for separated retina, use could now be made of it in cases of glaucoma also. It should be emphasized at the outset that cyclodiathermy is not a panacea for glaucoma and should be used only in those cases in which other time-tested methods of treatment had failed. Perhaps the first use of the idea of cutting down the amount of aqueous formed was the cyclodialysis of Heine in 1905. Shahan and Post, in 1921, in this country attacked the ciliary body with the thermophore and, in 1924, Verhoeff actually cut out a portion of the ciliary body. In 1940, Vogt reported the first destruction of the ciliary body with diathermy.

Drs. Dunphy and Albaugh used the following procedure: (1) Perforating cyclodiathermy; in this operation Walker points were introduced in two rows at 3 mm. and 5 mm. from the limbus over half of the globe. (2) Nonperforating; here a Weve flat electrode is applied in the same area but no perforations are made. We used atropine postoperatively. The complications were few and not serious. The operation was simple and did not appear to disturb the eye.

The advantages were that there was no collapse of the anterior chamber; iris and cornea were not disturbed; the patient was able to resume normal activity within 24 hours, and the danger of sympathetic ophthalmia was much less than in the usual surgery. Indications for the operation were: hemorrhagic glaucoma, aphakia with glaucoma, buphthalmos, occasionally primary glaucoma, and, depending upon the particular case, it could be assumed that about 60 percent of the cases would be successfully controlled; in another 10 to 15 percent the tension might remain elevated but the patient would be comfortable.

It was to be hoped that, although this was not a "cure-all" procedure, other new developments may be made along the same lines.

Harold F. Whalman,
Editor

AMERICAN JOURNAL OF OPHTHALMOLOGY

Published Monthly by the Ophthalmic Publishing Company

EDITORIAL STAFF

DERRICK VAIL, COL. (MC), A.U.S., *Editor-in-Chief* (on active duty)

LAWRENCE T. POST, *Acting Editor-in-Chief*
640 South Kingshighway, Saint Louis 10

WILLIAM H. CRISP, *Consulting Editor*
530 Metropolitan Building, Denver

WILLIAM L. BENEDICT
The Mayo Clinic, Rochester, Minnesota

FREDERICK C. CORDES
384 Post Street, San Francisco

SIR STEWART DUKE-ELDER, BRIG.
63, Harley Street, London

EDWIN B. DUNPHY, LT. COMDR. (MC), U.S.N.R.
c/o American Embassy, London

HARRY S. GRADLE
58 East Washington Street, Chicago

S. RODMAN IRVINE, CAPT. (MC), A.U.S. (on active duty)

DONALD J. LYLE
904 Carew Tower, Cincinnati 2

RALPH H. MILLER, CAPT. (MC), A.U.S. (on active duty)

ALGERNON B. REESE
73 East Seventy-first Street, New York

M. URIBE TRONCOSO
500 West End Avenue, New York

F. E. WOODRUFF
824 Metropolitan Building, Saint Louis

ALAN C. WOODS
Wilmer Ophthalmological Institute, Baltimore

EMMA S. BUSS, *Manuscript Editor*, 5428 Delmar Boulevard, Saint Louis 12

Directors: LAWRENCE T. POST, President; WILLIAM L. BENEDICT, Vice-President; DONALD J. LYLE, Secretary and Treasurer; WILLIAM H. CRISP, HARRY S. GRADLE, DERRICK VAIL.

Address original papers, other scientific communications including correspondence, also books for review and reports of society proceedings to *Dr. Lawrence T. Post, 640 South Kingshighway, Saint Louis 10, Missouri.* Manuscripts should be typed in double space, with wide margins.

Exchange copies of medical journals should be sent to *Dr. William H. Crisp, 530 Metropolitan Building, Denver, Colorado.*

Subscriptions, applications for single copies, notices of changes of address, and communications with reference to advertising should be addressed to the *Manager of Subscriptions and Advertising, 837 Carew Tower, Cincinnati 2, Ohio.* Copy of advertisements must be sent to the manager by the fifteenth of the month preceding its appearance.

Author's proofs should be corrected and returned within forty-eight hours to the *Manuscript Editor, Miss Emma S. Buss, 5428 Delmar Boulevard, Saint Louis 12, Missouri.* Twenty-five reprints of each article will be supplied to the author without charge. Additional reprints may be obtained from the printer, the George Banta Publishing Company, 450-458 Ahnaip Street, Menasha, Wisconsin, if ordered at the time proofs are returned. But reprints to contain colored plates must be ordered when the article is accepted.

REHABILITATION OF THE WAR-BLINDED

Elsewhere in this issue Sir Ian Frazier's "Whereas I was blind" is reviewed. The account of his own experience and the founding and development of St. Dunstan's in the past 25 years may well serve as examples of what may be accomplished for our own war-blinded in this country.

At one time it appeared the Veterans Administration would be the organization in the United States that would take over the care of the war-blinded immediately upon release from the base hospital where care of the acute condition is to be completed. Now, however, a somewhat different plan is contemplated. It is understandable that an organization that will have to concern itself with ten million and more men cannot devote much time to the social rehabilitation of perhaps a thousand men, and will be content to see that the financial help provided by the nation is administered properly to this blinded group. For perhaps 20 percent of these this will be the only help that they desire, but an effort to provide cultural, social, and instructive aid to any who desire it and are capable of utilizing it must be made.

The latest plan for our men involves admission to one of two hospitals, one on the Atlantic and the other on the Pacific

coast, especially designated for medical and surgical care of those with eye injuries or eye diseases. As soon as possible they will be discharged to an eye rehabilitation center under Army direction where both Army and Navy patients will receive care.

This center will be near a large city where the patients may not only enjoy such cultural pursuits as are provided by the theater and concerts but also, and much more important, may have a chance to find out whether they are fitted for employment in certain of the industries. Arrangements will be made to give the blind man opportunities to try various types of work in order to discover his likes and his adaptability. It is in this center that the newly blinded will learn the first things about taking physical care of themselves, eating, shaving, smoking, and such matters. They will begin the study of Braille. They will have the constant companionship of someone trained in the care of the blind, with psychiatrists available who will give them the proper approach to the new lives that they must now lead. The first depression must be overcome. A renewed faith that life is still worth living must be kindled. At this point the relatives must be educated in the proper attitude toward blindness. The demoralizing effect of demonstrations of pity must be clearly presented and strongly deprecated.

The time to be spent in this preliminary training center will vary greatly with the individual. One of our boys, blinded in this war, who had been a newsdealer before the war, was convinced that he could return at once to his home and take up his employment again. He was even optimistic enough to believe that he could make more of a success of it because he was blind! That is true courage. A man like that need stay only a very brief time at a training center. He can be discharged from the Army, his pension, which is a generous one, started, and arrangements made for such further study as he may wish to take at home. The most important problem in his case may well be that of his home folks, to see to it that they do not let their pity for him be obvious, to encourage his independence, and to let him feel that he is still one of them as before, and has not become a person apart because of his lost vision.

On the other hand, there will be those who have been completely shaken by their sudden loss, for whom months of mental rehabilitation is necessary. Some will show a natural adaptation for certain lines of work that are open to the blind, others none at all. Braille is difficult. There are many who cannot learn it, but this applies more to the old than to the group of war blinded. However, it would be ingenuous to think that the man who never did care for reading even when sighted is going to be enthusiastic about the study of Braille. No matter how much one may desire it and strive to give some men the broader education to fit them for lives of usefulness, there will always be a considerable percentage who are destined to be porch sitters. With a good pension, probably more money than any of them ever had before, they are going to be satisfied to do nothing constructive. It is only to be feared that some of their relatives will seek to live on the same pension!

The ideal program for rehabilitation of the war-blind is immediate care for their injuries or eye diseases under the best possible supervision with psychologic aid at once by a psychologist trained in care of the blind. This step should be followed by transfer at the earliest possible moment to a center for the blind for preliminary rehabilitation, as described.

The arrangements planned for our soldiers and sailors up to this point are good. From here on the ideal is to discharge the

men to environments where they would have equal opportunities for social, occupational, and educational growth. Here our program falls down because we have no one national organization whose business it is to follow these men and look after their welfare. They are discharged with money in their pockets, each his own man to do as he likes. That is as it should be; but he returns, presumably to his home, where the only technical help that he will have in his further rehabilitation will be such as his state provides. In some states this is good, in many it is poor, and in some there exists practically none.

As Sir Ian Frazier points out, "Ultimately of course the After-Care Department became practically the whole of St. Dunstan's. . . ." Through this channel England has kept in constant touch with all of her war-blinded. It is their alma mater, their guide, counsellor, and friend, their point of reunion. A special dormitory is set apart for those returning to visit. This is all of vast importance to these men. To be sure the United States is far larger than Great Britain, but the principle is the same and it would seem that either through Government or private agency, or through both, some such organization should be established in our country, primarily or at least ultimately to include all of our blinded. Through this means there would be an adequate follow-up of a program well started by the Army, and undoubtedly this would be of inestimable value toward returning this group to a normal life.

Lawrence T. Post.

SELF-OBSERVATION OF RETINAL DETACHMENT

Patients are often skeptical regarding the extent to which physicians can sympathize with the symptoms and complaints of those to whom they minister. A famous western eye surgeon is reported to have stated that he never used on his patients any drug which he had not tried upon himself. There is room for argument that general adoption of such a rule might be beneficial.

It would naturally be out of the question to require every practitioner of a specialty to have personal experience of all that his patients endure in disease, whether medical or surgical. It may be supposed that, other things being equal, the most careful refractionists are those who have themselves suffered the inconvenience of uncorrected refractive errors. But, fortunately, few of us are called upon to encounter in our own persons the discomforts or tortures, the disabilities, the fears and hopes and disappointments associated with the onset, progress, and surgical treatment of glaucoma or retinal detachment.

The literature of ophthalmology presents a number of examples of self-observation in connection with eye disorders. The insidious development of glaucoma, and the process of adaptation to the blindness resulting from that disease, have been eloquently described by several ophthalmologists, notably Laqueur and Javal. There has been no dearth of description of the experiences connected with the gradual formation of cataract. Analogous studies have probably been published previously in relation to retinal detachment, although the present writer cannot just now lay hands upon any one of them.

An excellent description of personal experience with retinal detachment and its successful treatment comes now from the pen of a Brazilian colleague, identified to the world at large only by the initials "V. J.," but whose account is published with an introductory note by W. Belfort Mattos, of São Paulo, Brazil (Arquivos Brasileiros de Oftalmologia, 1943, volume 6, page 63).

"V. J.," having himself for years performed the diathermy operation for retinal detachment, was quite familiar with the symptomatology of the disease, and with the experiences of those who submitted to operation, as described by the patients. He is forty-five years old, and has ten diopters of myopia. He has had in the right eye two attacks of exudative choroiditis, which he attributes to a dental cause, and which have been treated focally and with subconjunctival injections of hypertonic sodium chloride.

In November, 1942, he suddenly developed a vitreous exudate in the left eye. This exudate improved quickly after attention to a dental granuloma, but V. J. noticed that in the upper outer sector of the visual field objects seemed to quiver slightly, and possessed a strange gleam as though covered by cellophane tissue. In the course of a few days this first symptom of detachment developed into a rapidly progressive narrowing of the visual field. Central vision had returned to normal, and the writer continued his daily practice of ophthalmology, including an operation for diathermy coagulation of retinal detachment.

V. J. records that he went to the office of his friend Pereira Gómez with the pupil dilated by homatropine. Looking in the appropriate direction he was able to place the eye so that the field of the examiner's ophthalmoscope included the probable site of the retinal tear, the point at which the patient had experienced his first symptoms of tremulous vision. The detachment was flat, with a V-shaped tear. V. J. says he "had waited all these days to confirm the rapid increase of the myopic retinal detachment, as distinguished from the slow and nonvarying detachment caused by choroidal tumor." The "cellophane tissue" reflexes and the phosphenes were no longer noticeable, but the narrowing of the visual field reached almost to the macula. However, the vitreous exudate had disappeared and macular vision was still 0.8 with the myopic correction and under mydriasis.

The retinal tear was readily localized, corresponding to the field position 20 degrees upward and outward, and to the 65-degree level, and being 12 mm. distant from the limbus.

V. J. states that his greatest inconvenience at the time of operation was from lavage of the conjunctival sac and from the procedure of limbal localization. The retrobulbar injection, to which some patients object so strenuously, bothered him not at all. On account of the high myopia and the direction in which he was forced to look, in order to expose the operative field in the lower inner quadrant, he was able to follow with both eyes every step of the operation. Every time the fine electrode perforated the sclera the retinal stimulation was intense, producing a "heavenly paradise such as is imagined by children and the faithful; an enormous variety of lights of all colors, resembling a scintillating mother-of-pearl, clouded the whole vision. . . ."

At the end of the operation, he says, "I distinguished fingers with the operated eye, which cheered me considerably because the danger of an immediate intraocular hemorrhage was much in my mind." No step of the operation was painful.

Dealing with the fixed position required during convalescence, emphasis is laid by V. J. on the value, at such a juncture, of previous training in self-control. A surprising experience, not previously imagined, was "an exquisite subjective sense of surrounding objects, persons, and things . . . : distorted figures, with three or more arms and legs, . . . twisted bodies. . . . A drinking glass, for example, only resumed its natural form when I touched it. I made an effort to evoke agreeable

hallucinations and only succeeded in seeing the worst of the so-called futuristic paintings. . . . I judge that my preoccupation not to move my head or eyes was the cause of all the subjective phenomena. . . ."

V. J. found his most unpleasant experience in convalescence to be the necessity for maintaining immobility in bed, spending five days and nights in a single position being sometimes impossible. "I was only successful in remaining three days immobile in the bed and after that I passed the day in the chair and lay down only at night, making the change between these two positions very slowly without displacing the head from its ideal position." Sleep was always taken in right lateral decubitus.

After eighteen days V. J. resumed his ophthalmologic practice, with normal vision. He confesses that some of the rules usually imposed upon patients by himself and other oculists were disregarded, "not from indiscipline," but because he found them exaggerated. Whereas resting the eye and keeping the head immobile in the proper position are indispensable, "immobility of the bed does not help the patient at all if the operation did not close or block the retinal tear. . . . If the operation did not go well, the retina which at the first examination appeared perfectly attached begins to become detached after the first six or eight days. Hence the absolute necessity for determining the cause of the detachment, whether traumatic, myopic, syphilitic, tuberculous, and so on."

After seven months V. J.'s operated eye retained normal vision with correction, a visual field merely contracted a little in the upper outer quadrant by reason of the cauterizations, a few organized exudates in the vitreous, and no phosphenes or other subjective or objective symptoms pointing to recurrence.

W. H. Crisp.

BOOK NOTICES

WHEREAS I WAS BLIND. By Capt. Sir Ian Frazier. Clothbound, 168 pages. London, Hodder and Stoughton, Ltd. Price 8/6.

This is a very readable story of a man blinded in the first World War as a boy of 18, who would never let himself be discouraged but went forward to make of himself an outstanding figure in England.

He describes his sensations and reactions from the onset of his blindness through his varied career. He became assistant to Sir Arthur Pierson, who was director of St. Dunstan's in its early years, and, upon the death of Sir Arthur, in 1922, succeeded him as director of that institute. The author had multifarious interests: From the directorship of St. Dunstan's he was elected to Parliament, where he served several terms, always acting in the interests of the blinded. He later had a connection with the British Broadcasting Company.

The book is valuable from many points of view, perhaps foremost of which is the reaction of the individual to blindness. It is a good directive for those who have to do with the rehabilitation of the blind. This subject is particularly pertinent in these days when the number of our war-blinded is steadily increasing. The book also gives an interesting account of the development of St. Dunstan's, and points out the important sphere of influence that this organization has, its greatest value being in its Aftercare Department. The volume will be of value to all ophthalmologists because they have frequently to deal with the blind individual, and their contacts with the patient in the early stages of his blindness will be important in coloring his entire future.

Lawrence T. Post.

STRABISMUS, ITS ETIOLOGY AND TREATMENT. By Oscar Wilkinson. Second Edition; 369 pages; cloth binding; illustrated. Boston, The Meader Press. Price, $4.00.

This edition of "Strabismus" is presented by Dr. Oscar Wilkinson in collaboration with Dr. Richard W. Wilkinson. The first 115 pages are devoted to the history of strabismus, the theories regarding its etiology, and a discussion of the physiology of the ocular muscles and of the physiology of vision. The second section of 75 pages is devoted to the types of strabismus and the methods of measuring the deviations. The third section of 170 pages is divided into the non-operative and operative treatment of squint. The chapter on Orthoptics has been rewritten and demonstrates the usefulness of the amblyoscope in diagnosing and treating squint. The chapter on Operative Treatment emphasizes the importance of accurate measurements in diagnosis and their value in selecting the most desirable type of surgery. Excellent illustrative cases with histories and photographs are shown in the last chapter.

The authors have presented clearly and concisely a great amount of controversial material. At the same time their opinions, choice of methods, and their results have been recorded.

William M. James.

CORRESPONDENCE

Type for income-tax instructions

January 19, 1944

To the Editor:

In the last few months many of my elderly patients, and even some of the younger ones, have complained to me bitterly about the illegibility of the type in which the various income-tax blanks, and particularly the "Instructions" which accompany them, are printed. I have therefore written to a Congressman friend asking him to see to it that no matter shall be printed on either blanks or the "Instructions" in smaller type that 10-point single-leaded. My Congressman friend replies that the request appears to him perfectly reasonable and that he will do his utmost to see that, in the pending income-tax reform-bill, the suggested requirement shall be incorporated.

To me it seems especially fitting and proper that the requirement in question should be backed by the medical group whose function and duty it specially is to safeguard, so far as possible, the eyes of the nation. The present moment, too (when both houses of Congress are in session and earnestly considering such a reform of the income-tax law as will enable at least ordinary people, engaged in ordinary business, to fill out their blanks correctly by the exercise of ordinary common sense), also seems to me the particularly appropriate time for seeing to it that ordinary people with ordinary eyes shall be able to see for themselves just what the requirements are which they, under very heavy penalties, are called upon to meet.

Will not, therefore, each and every ophthalmologist write three letters—one to his congressman and one to each of his U. S. senators, urging him to work for the adoption in the pending income-tax bill of the requirement that nothing on the income-tax return-blanks or on the "Instructions" explaining such blanks shall be printed in smaller type than 10-point single-leaded?

This matter should be attended to now. Delay would be fatal to the idea.

Your sincerely,

(Signed) Thomas Hall Shastid.

ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is mentioned only in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. General methods of diagnosis
2. Therapeutics and operations
3. Physiologic optics, refraction, and color vision
4. Ocular movements
5. Conjunctiva
6. Cornea and sclera
7. Uveal tract, sympathetic disease, and aqueous humor
8. Glaucoma and ocular tension
9. Crystalline lens
10. Retina and vitreous
11. Optic nerve and toxic amblyopias
12. Visual tracts and centers
13. Eyeball and orbit
14. Eyelids and lacrimal apparatus
15. Tumors
16. Injuries
17. Systemic diseases and parasites
18. Hygiene, sociology, education, and history
19. Anatomy, embryology, and comparative ophthalmology

1

GENERAL METHODS OF DIAGNOSIS

Costi Garcia de Tuñón, Carlos. **Presentation of a new umbralometer.** Arch. de la Soc. Oft. Hisp.-Amer., 1942, v. 1, July, pp. 114-122.

The author's apparatus, illustrated only schematically in the article, includes a four-volt lamp, a battery with variable resistance, a collimator, a pair of Nicol prisms, and the necessary supports and other accessory details. By rotation, the Nicol prisms serve as a means of obscuration, which reaches its zero point with complete crossing of the prisms. The advantages claimed for the apparatus are: continuous control of the intensity of the current and of the mechanism of obscuration; elimination of the factor of accommodation; the possibility of making observations in the presence of low visual acuity; and the basing of the measurements, not upon light perception, but upon the "minimum perceptible," which affords greater sensitivity and greater rapidity of investigation. (2 illustrations.)

W. H. Crisp.

Craik, K. J. W. **Specifications for dark-adaptation tests.** Brit. Med. Jour., 1943, May 22, p. 632. (See Section 10, Retina and vitreous.)

Drews, L. C. **Further observations on autofundoscopy (auto-ophthalmoscopy of Eber; Purkinje figure of Walker).** Amer. Jour. Ophth., 1943, v. 26, Nov., pp. 1143-1154; also Trans. Amer. Ophth. Soc., 1942, v. 40, p. 370. (2 drawings, references.)

Krimsky, Emanuel. **Graphic representation of binocular findings.** Amer. Jour. Ophth., 1943, v. 26, Nov., pp. 1199-1204. (7 graphs.)

Oak, Lura. **The Massachusetts vision test, an improved method for school vision testing.** Amer. Jour. Public Health etc., 1942, v. 32, Oct., pp. 1105-1109.

Considerations on the system of testing children's eyes in Massachusetts schools, regarding the inadequacy of Snellen test type, as to the proper test-type distance, and as to the type of illumination led the author to the conclu-

sion that the validity of the test might be increased through selection and training of qualified persons, the reliability of records being further increased by improvements in material and methods with a view to minimizing opportunities for memorization and to calibrating a standard of illumination upon the charts. The new method now available for general use is designed to bridge the gap between present inadequate provisions and the time when the eyes of all children will, it is hoped, be examined by qualified eye specialists. Administration of the test requires an average time of 2½ minutes for children eight years of age or older. The test kit consists of the standard Luckiesh-Moss illuminator, the improved form of Snellen test type, a house chart mounted on a frame with an electrical tester, spectacles with plus spherical lenses, others with Maddox rods, and a central switch for controlling the lights. It further contains tests for latent hyperopia and muscle imbalance. Melchiore Lombardo.

Ramsay, A. M. **The ophthalmoscope in clinical medicine.** Brit. Med. Jour., 1943, June 5, p. 685.

With the aid of the ophthalmoscope the clinician is able to observe the physiologic and pathologic processes in the eye. Especially the effects of a disordered metabolism on the cardiovascular system can be detected at the earliest onset. The information thus gained by the clinician may be likened to the reports obtained from the laboratory. Like laboratory reports, the ocular findings can be properly evaluated only when they are correlated with general symptoms of the disease.

R. Grunfeld.

Riddell, W. J. B. **On testing dark adaptation.** Glasgow Med. Jour., 1943, v. 21, June, pp. 149-157. (See Section 10, Retina and vitreous.)

Sugar, H. S. **A new material for anterior-segment impressions.** Amer. Jour. Ophth., 1943, v. 26, Nov., pp. 1210-1211.

Yudkin, J., and Ferguson, A. **A critique of the Bishop Harman test for night vision.** Brit. Med. Jour., 1943, May 22, p. 632. (See Section 10, Retina and vitreous.)

2

THERAPEUTICS AND OPERATIONS

Bertotto, E. V. **Evipan-sodium in ocular surgery.** Anales Argentinos de Oft., 1942, v. 3, Oct.-Nov.-Dec., p. 204.

The use of evipan and its advantages in ocular surgery are discussed. The author's experience with one case was satisfactory. Eugene M. Blake.

Borak, J. **X-ray therapy of inflammatory and neoplastic diseases of the eye.** Amer. Jour. Ophth., 1943, v. 26, Nov., pp. 1170-1174. (11 figures.)

Fleming, Norman. **Iontotherapy (ionic medication, iontophoresis, ionisation) as an aid in ophthalmic therapeutics.** Brit. Jour. Ophth., 1943, v. 27, Aug., pp. 354-367.

Poor results obtained by the old methods of iontotherapy are blamed upon too strong currents, too strong solutions and too long applications. An apparatus is described and illustrated in which the power is derived from small batteries, ensuring that the milliamperemeter needle never indicates more than two milliamperes. The instrument is so constructed that positive ions such as calcium and zinc are introduced into the eye, and it is provided with a reversing switch for introducing negative ions such as salicylates.

Cases of conjunctivitis are reported, both acute and chronic, in which iontotherapy gave excellent results. Corneal ulceration and herpes ophthalmicus, as well as iritis, episcleritis, and scleritis, also respond favorably to iontophoresis. Also reported are a case of retrobulbar neuritis and one of embolism in which the outcome of treatment with ionic medication was satisfactory. The application used most often was six parts of calcium chloride (1 to 500) with one part of adrenaline hydrochloride (1 to 10,000). Treatment to the eye itself is usually not given for more than two minutes; to the everted eyelids for not more than one and a half minutes; and to the closed lids for not more than five minutes. A small quantity of zinc sulphate (1 to 400) is added to the calcium solution when there is loss of epithelium. Silver nitrate (1 to 1,000) or soluble prontosil (1 to 10,000) is added where a powerful antiseptic is required. Atropine, acetylcholine, histamine, quinine, eserine, pilocarpine, iodides, salicylates, and other drugs may be used.

The principal feature of treatment by iontotherapy is reduction of congestion and so of inflammation generally. The claims of success in treatment of deep as well as of superficial inflammation are based on experience gained in the treatment of about one thousand cases during the past ten years. Iontotherapy is likely to be of particular value in the treatment of war casualties. (4 figures, references.)

Edna M. Reynolds.

Frey, Guernsey. **"Through evil, good."** Amer. Jour. Ophth., 1943, v. 26, Nov., pp. 1208-1209.

Gallo, L. A. **Use of dental absorbent rolls in ocular surgery.** Anales Argentinos de Oft., 1942, v. 3, Oct.-Nov.-Dec., p. 210.

Gallo employs dental absorbent rolls in ocular surgery and recommends them to others. They come in several sizes and are sterilized by placing in oxycyanide solution, 1 to 1000, to which is added 50 drops of formol.

Eugene M. Blake.

García Miranda, Antonio. **Importance of the slitlamp in the study of starvation conditions.** Arch. de la Soc. Oft. Hisp-Amer., 1942, v. 1, July, pp. 108-113. (See Section 17, Systemic diseases and parasites.)

Hughes, W. L. **Water bath for maintaining proper temperature of eye-irrigation solutions.** Amer. Jour. Ophth., 1943, v. 26, Oct., pp. 1089-1091. (3 illustrations.)

Paula Santos, B. **On the anti-infectious action of the sulfanilamides in ophthalmology.** Arquivos Brasileiros de Oft., 1943, v. 6, April, pp. 25-37.

The author, whose article is accompanied by five pages of bibliography, reviews the literature of the subject and considers the three modes of introduction of these drugs, namely the parenteral, the oral, and the local. With some other writers, he is disposed to take a conservative view as to the benefits to be derived in trachoma. In this disease he regards the action of the sulfanilamides as relating particularly to secondary infection, and only indirectly to the trachoma itself. He finds that, as indicated by the slitlamp, the limbal and conjunctival follicles are reduced but do not disappear. In some exceptional cases, treatment for as long as a year failed to yield results.

W. H. Crisp.

Pokrovsky, A. I. **Remarks on ocular war surgery.** Viestnik Oft., 1943, v. 22, pt. 2, p. 3.

This is a plea for the more extensive use of fat implantation in plastic surgery of the lids. Although first proposed by Silex in 1896, its use is not so widespread as the author believes it deserevs to be. It is particularly indicated in retracted scars of infected wounds of the lids, in which the skin although not shortened is drawn in and adherent to the periosteum. The deformity of such subcutaneous cicatrices can be relieved by freeing the skin from the periosteum and interposing between it and the subcutaneous tissue a layer of fat. The cosmetic appearance of disfiguring cutaneous transplants can be improved by padding them with a layer of fat. Four cases illustrating the effectiveness of fat transplantation in such cases are briefly reported.

Fat implantation is also useful in bony defects of the orbit caused by orbital injuries, or slowly growing orbital neoplasms. The retraction of the lids caused by such defects can be remedied by implantation of fat. The fat fills in the defect, does away with the retraction of the cicatrices, and improves the cosmetic appearance of the lid folds. It should be kept in mind that fat has no resistance to infection, and its implantation should not be attempted until infection has run its course.

The author also makes a plea for careful primary repair of lid injuries. While the general rule is to introduce no sutures in field stations, in injuries of the lids this rule does not apply. The lids are very resistant to infection, and primary sutures restoring the normal position and contour of the lids will save the injured person many subsequent plastic procedures. The conjunctiva too is resistant to infection; and in injuries of the orbit and eyeball, requiring enucleation of the eyeball, the orbital and conjunctival wounds should be properly coapted and repaired so that an artificial eye may be worn subsequently. The author deplores the frequent performance of enucleations without attention to orbital and conjunctival wounds, so that symblepharon and obliteration of the conjunctival sac necessitate subsequent operations.

Another procedure advocated by Pokrovsky is that of multiple conjunctival incisions parallel to the lid margin for the enlargement of a shrunken conjunctival sac. After such incisions the introduction of a large prothesis lubricated with cod-liver oil leads to the epithelization of the conjunctival wounds, with permanent enlargement of the socket. Ray K. Daily.

Post, L. T., and Robertson, E. N. **Intravenous pentothal-sodium anesthesia in ophthalmology.** Amer. Jour. Ophth., 1943, v. 26, Nov., pp. 1155-1163. (One table, references.)

Scott, G. J. **Effectiveness of sulfonamides when applied locally to the eye.** Trans. Ophth. Soc. United Kingdom, 1942, v. 62, pp. 3-13.

The author describes the effectiveness of the sulfonamides when used locally in ophthalmology as reported by research workers. With this as a basis he discusses the clinical use of the drugs. The sulfonamides are bacteriostatic except in very high concentration. The general defense mechanism of the body must be stimulated by specific or nonspecific measures. Oral or parenteral administration is indicated in infections of the orbit, lids, or conjunctiva, which can be reached through the blood stream in a concentration of 5 to 10 mg. per 100 c.c.

In treatment of an avascular structure such as the cornea the concentration of the drug must be aided by some form of local application. The value of purely local treatment is in prevention of infections of the eye in first-aid treatment of industrial injuries. In local treatment of acute infections, satisfactory results have been obtained only where the local applications were used at hourly, half-hourly, or even 15-minute intervals. (5 tables, 2 illustrations, references.) Beulah Cushman.

Sorsby, Arnold. **Ocular pharmacology of the sulfonamides.** Trans. Ophth. Soc. United Kingdom, 1942, v. 62, pp. 15-33.

From a review of the experimental use of the sulfonamides, the author concludes that clinically sulfapyridine seems the most effective in the eye. The dosage should be calculated for each patient on the basis of body weight, to maintain the optimum concentration of 10 mg. per 100 c.c. in the blood. The ocular complications of sulfonamide therapy are transitory myopia, retinal hemorrhages, optic neuritis, and conjunctival reactions. (Bibliography.) Beulah Cushman.

Thygeson, P., and Stone, W. Jr. **Sulfonamide therapy of ocular infections.** New York State Jour. Med., 1943, Aug., p. 1409.

Sulfadiazine, because of its low toxicity, is the drug of choice for oral administration in most ocular infections. The infections responding rapidly to oral sulfonamide therapy included gonorrheal, conjunctivitis due to trachoma, acute dacryocystitis, and corneal ulcers due to streptococcus hemolyticus and pyocyaneus. Slow in response were blepharitis, conjunctivitis, and corneal ulcers due to staphylococcus aureus. No response was found in tuberculosis, hemolytic streptococcus infections, pemphigus, virus infections, and sympathetic ophthalmia.

Local sulfonamide therapy is employed with success in superficial infections including blepharitis, conjunctivitis, and corneal ulcerations. Sulfathiazole ointment in blepharitis and conjunctivitis and sulfadiazine powder in corneal ulcerations seem to give the best results. Combined oral and local therapy should be used in severe infections. (3 tables.)

Gertrude S. Hausmann.

Von Sallmann, Ludwig. **Penicillin and sulfadiazine in the treatment of experimental intraocular infection with pneumococcus.** Arch. of Ophth., 1943, v. 30, Oct., pp. 426-436.

Various types of pneumococcus were inoculated into rabbit eyes and the results of treatment with sulfadiazine and penicillin were observed. It was found that infections caused by D. pneumoniae type III and type X were not stopped or were only temporarily improved by intensive local and systemic treatment with sulfadiazine. Severe intraocular infection by types III, X, and VII was usually checked by local treatment with penicillin. Infections caused by injection of types III and X with simultaneous injury to the lens capsule were treated successfully with penicillin in most instances. The iontophoretic introduction of the penicillin salts in 0.1 and 0.25 percent solutions was occasionally more effective than the corneal bath of a 0.25 percent solution. Repeated applications of a 0.25 percent solution by iontophoresis caused large abrasions of the cornea which healed without opacity. Strains of pneumococcus types VI, XIV, XIX,

and XXIII showed in vitro the same sensitivity to penicillin as the strains used in the rabbit experiments. (Bibliography.) John C. Long.

Wiener, M. **Transplantation of preserved tissue in ophthalmic surgery.** Jour. Michigan State Med. Soc., 1943, v. 42, Jan., p. 53.

The author presents a very interesting detailed account of the subject as regards corneal and conjunctival tissue. He describes in detail his technique of conjunctival implantation. He believes that preserved heterogeneous implants may be of value in plastic surgery wherever mucous membrane is needed.

T. M. Shapira.

3

PHYSIOLOGIC OPTICS, REFRACTION, AND COLOR VISION

Burian, H. M. **A visual phenomenon related to binocular triplopia.** Amer. Jour. Ophth., 1943, v. 26, Oct., pp. 1084-1086. (References.)

Burton, E. W. **Progressive myopia: a possible etiologic factor.** Trans. Amer. Ophth. Soc., 1942, v. 40, pp. 340-354.

Myopia is defined and the various theories advanced in the literature are reviewed. Particular emphasis is placed on the mechanical theories of myopia. The role of the orbicularis muscle in progressive myopia is discussed and a method of clinically testing the strength of the muscle is presented. Axial myopia was experimentally produced in young rabbits by mechanically constricting the globe at its equator with a tight silver wire. The intraocular pressure was thus elevated a reasonable amount, producing anteroposterior elongation of the eyeball.

The author concludes that frequently myopes who are undercorrected or who wear no correction at all resort to the habit of squeezing the eyelids together in order to make the diffusion circles smaller. When myopia is fully corrected, distant vision is distinct and there is less tendency to squeeze the lids together. Fully corrected myopia seems to show less tendency to progress than that which is only partially corrected. Contraction of the orbicularis muscle probably causes an increase in intraocular pressure which, if maintained over a long period of time, may cause stretching of the sclera not only in the very young, but also in older individuals if the sclera is already weakened. Elongation of the anteroposterior diameter of the eyes of rabbits can be produced by increasing the intraocular pressure. (7 illustrations, bibliography.)

David O. Harrington.

Elder, J. H. **Effectiveness of vitamin A in the treatment of defective color vision.** Science, 1943, v. 97, June 18, p. 561.

Sixteen college students who had defective color vision were given 25,000 units of vitamin A daily for eight weeks. One of the students took 250,000 units daily. Fourteen students, including the one just mentioned, showed no improvement whatsoever. Two students achieved perfect scores and passed the Army-Air-Corps tests. These two, however, had very slight defects.

A second experiment was made with 58 subjects who received 50,000 units of vitamin A every second day for eight weeks and were obliged to swallow the capsules under supervision. Of the 41 persons who finished the course of treatment, not one showed any im-

provement. The author draws the conclusion that vitamin A fails to produce any significant improvement in color sensitivity, although in a negligible few instances, where the defects of color vision are of minor degree, it may improve the color vision slightly.

R. Grunfeld.

Judd, D. B. **Color-blindness and the detection of camouflage.** Science, 1943, v. 97, June 18, p. 544.

The author analyzes the conditions under which a color-blind and a color-screened normal observer respectively could detect a camouflaged position.

R. Grunfeld.

Low, F. N. **Studies on peripheral visual acuity.** Science, 1943, v. 97, June 25, p. 586.

Peripheral visual acuity was measured on the perimeter by the use of Landolt's broken circles with breaks of various sizes. The test objects were placed at 30 and 60° and at the four points of the compass. The size of the break in the smallest circle successfully identified four times in succession was scored. The peripheral visual acuity thus measured was found to be an independent factor. It did not correlate with age, sex, central visual acuity, or color vision. The second eye, generally, scored better than the first. A 6-percent improvement was recorded when the test was repeated and a 16-percent gain noted when the test was taken for the third time. This indicates that peripheral visual acuity can be trained.

R. Grunfeld.

Luckiesh, M., and Moss, F. K. **Comparison of a new sensitometric method with usual technics of refraction.** Arch. of Ophth., 1943, v. 30, Oct., pp. 489-493.

This sensitometric method of refraction is a subjective method in which the dioptric power producing maximal visibility is determined with the Luckiesh-Moss sensitometer. In this method relative accommodation is avoided by the elimination of all adequate optical stimuli for accommodation from the entire binocular field. Satisfactory control may not be obtained by the fogging method, as the stimulus for relative accommodation increases as the plus power is decreased. The sensitometric method involves binocular parafoveal stimuli sufficient to insure convergence at a point in the plane of the test object. However, it has been shown that this is an inadequate stimulus for relative accommodation. In the usual methods of testing, monocular and foveal stimuli for accommodation as well as for convergence are present.

Sensitometric observations have demonstrated that the normal eye is myopic in the absence of stimuli for relative accommodation and that it may become emmetropic when such stimuli are present. In formulating a dynamic definition of emmetropia, the authors state that this condition exists when all points within the range of habitual near vision and the retinas are conjugate without the exercise of relative accommodation (and with the static addition), while more distant points may become conjugate by the exercise of negative relative accommodation.

John C. Long.

Martin, J. E. **Atropine glaucoma.** Brit. Med. Jour., 1943, May 22, p. 631. (See Section 8, Glaucoma and ocular tension.)

Pascal, J. I. **Cylinder retinoscopy—simplified.** Amer. Jour. Ophth., 1943, v. 26, Dec., pp. 1304-1308.

Sloane, A. E. **Refraction clinic.** Amer. Jour. Ophth., 1943, v. 26, Nov., pp. 1212-1215.

Stocker, F. W. **Pathologic anatomy of myopic eye with regard to newer theories of etiology and pathogenesis of myopia.** Arch. of Ophth., 1943, v. 30, Oct., pp. 476-488.

The usual pathologic changes encountered in high myopia are discussed, together with the detailed findings in a myopic eye of a fifteen-year-old boy. Thinning of the posterior pole of the globe has been found almost regularly in severe myopia, and a flat arrangement of the scleral fibers is generally found in such cases of thinning. Temporal conus is usually present but does not generally appear until the second decade. Along with temporal conus in cases in which the retina overlaps the choroid toward the optic disc, the nerve fibers corresponding to the most temporal part of the optic nerve turn around the edge of the retina and form a "temporal nerve-fiber loop". Supertraction of the retina over the nasal part of the disc is often found in high myopia. Atrophy of the choroid occurs but usually does not develop until later in life, at which time the progress of the myopia is relatively stationary. Retinal changes appear to be largely associated with atrophy of the choroid.

The conventional theory of the causation of myopia considers that the sclera, choroid, and retina are stretched by some force. The author adheres to the theory of Vogt that the retina is the determinative factor in the size of the eye. If the retina has a stronger tendency to grow than the sclera, the latter may be stretched. The "push" delivered by the developing retina is to be considered in the biological rather than in the mechanical sense. It has been shown pathologically that in young myopic eyes there may be considerable stretching of the sclera while the retina remains normal. Retinal changes develop late and are secondary to choroidal atrophy. It seems possible that each coat of the eye has its own inherited potential of growth. In the majority of persons, there exists enough coördination of growth to bring about the development of an eye which is emmetropic or nearly so.

John C. Long.

Vishnevsky, H. A., and Flekkel, A. B. **A study on the recognition of colored signals by persons with defective color vision.** Viestnik Oft., 1943, v. 23, pt. 1, p. 16.

Defective color vision was found in 8 to 9 percent of applicants for schools of aviation, in 1 percent of the flying personnel and aviation cadets, and in 14 percent of applicants rejected because of ocular defects. In order to determine to what extent it would be possible to utilize color defectives in aviation, 41 persons with color defects were given a laboratory examination and a practical test on recognition of the colored signals which are very important in night flying. Colored signals are used to avoid collision in formation flying, to make contact with the ground, and to mark interferences in landing. The test objects were colored flares used in aviation, aërial navigation lights, and colored signals observed from the ground and from the air. The laboratory examination consisted of tests with the Stilling, Ishihara, and Rabkin plates, and with the Nagel anomaloscope. The test with flares was carried out at night on a river bank. The recognition of colored signals on the ground was recorded

from a distance of 1,000 meters, and then at intervals of 100 to 500 meters. Recognition in flight was tested at 1,000, 800, and 600 meters. The signals were white, red, yellow, green, and blue.

The data show that recognition of green, red, and yellow flares is difficult even for normal trichromates, three out of nine calling yellow flares red. Among persons with anomalous deuteranopia the errors were very high, only two out of 29 giving the correct answers. Since each colored flare has a definite meaning, confusion is obviously dangerous in military aviation. Recognition of colored signals is very poor in anopes and anomalous deuteranopes, even at a distance of 500 to 600 meters.

The conclusions are that classification of defective color vision is difficult with colored plates, and can best be done with the anomaloscope. The correlation of the laboratory data and practical tests shows that the largest number of errors is made by anopes. Persons with identical defects in color vision varied in their responses to the practical tests. Recognition of aviation signals differs from railroad and automobile signals in the small visual angle under which the lights are seen and in the required rapidity of recognition. Proper response to colored signals in aviation requires correct recognition and identification of the color.

Ray K. Daily.

4

OCULAR MOVEMENTS

Allen, T. D. **Eyes right and down—not eyes down and right.** Amer. Jour. Ophth., 1943, v. 26, Nov., pp. 1209-1210.

Fralick, F. B. **The treatment of amblyopia.** Amer. Jour. Ophth., 1943, v. 26, Nov., pp. 1195-1197.

Nugent, O. B. **The management of strabismus.** Jour. Iowa State Med. Soc., 1942, v. 32, Dec., pp. 533-537.

An attempt is made by the author to classify the cases of strabismus according to age of the patients and a system of treatment to be applied to each age group, as follows: (1) In patients from one to six years of age, correction of error of refraction under cyclopegia, daily occlusion of the good eye, attention to avitaminosis, orthoptics; (2) in patients from 7 to 15 years, correction of error of refraction under cycloplegia, occlusion of functioning eye, orthoptics; (3) in patients from 15 to 30 years of age, correction of refraction, orthoptics, surgery, postoperative orthoptics; (4) In patients 30 years of age and beyond, refraction manifest or cyclopegic, surgery. The writer discusses various surgical methods, and describes the technique which he favors, namely, recession with a control suture. A vertical 10-mm. incision is made in the conjunctiva with iris scissors over the point of attachment of the muscle. The muscle is dissected from conjunctiva and Tenon's capsule for about 5 mm., and is then cut loose from the globe with the same iris scissors while it is steadied with a muscle clamp. For control suture a no. 4 doubly-armed silk thread is used, being placed through the muscle tendon in such a manner as to hold the muscle flat against the sclera. The cut edges of the conjunctiva are sutured. The eyes are inspected to determine their relative position, using the corneal reflex from the light of an electric ophthalmoscope; and other surgery is performed on the same or the second eye if necessary. The control suture is then adjusted so as to produce parallelism between the visual axes of the two eyes, using a Maddox rod in front of the

unoperated eye while the patient wears his correcting glasses. A surgeon's knot is made and the loose ends of the control suture are fastened on the patient's forehead. Readjustment is repeated if necessary, and the suture is removed on the fourteenth day. References, 8 illustrations.) M. Lombardo.

Prangen, A. DeH. **The relationship of orthoptic treatment to surgery.** Amer. Jour. Ophth., 1943, v. 26, Dec., pp. 1298-1302. (References.)

Stark, E. K. **Evaluation of orthoptic instruments.** Amer. Jour. Ophth., 1943, v. 26, Dec., pp. 1308-1312.

Walraven, Frances. **The parents' role in orthoptic training.** Amer. Jour. Ophth., 1943, v. 26, Nov., pp. 1175-1179.

5

CONJUNCTIVA

Browning, S. H. **Tuberculosis of conjunctiva.** Proc. Royal Soc. Med., 1943, v. 36, June, pp. 407-408.

The author presents the case of a 29-year-old female patient who had a hard, punched-out ulcer on the left lower eyelid, sections of which showed giant-cell systems and acid-fast bacilli. Guinea-pig inoculation was positive. In the accompanying discussion, it was brought out that these cases of human-type tubercle of the lids were usually not part of a generalized tuberculosis. The value of ultraviolet and heliotherapy, as well as of sanatorium régime, was also stressed.

Benjamin Milder.

Gallaher, Clinton. **A study of trachoma with a report of 318 cases, 233 treated with sulfanilamide.** Jour. Oklahoma State Med. Assoc., 1943, v. 36, May, p. 185.

Basing his opinion on the great number of trachoma patients treated with sulfanilamide and observed for an appreciable period, the author believes that although sulfanilamide may not be beneficial in every case of trachoma one can be assured that it will be of great benefit in over 90 percent of the cases. In cases of subepithelial follicles and beginning pannus the treatment consisted of peroral administration of sulfanilamide only. In cases with papillary hypertrophy and advanced pannus, sulfanilamide was given by mouth and the case was observed for three to four weeks, after which grattage was done. This was followed by local administration of one-percent sulfanilamide in Ringer's solution, and at bedtime 0.5-percent zinc ointment was applied. If phlyctenules or acute keratitis complicated the picture, vitamin A (afaxin in oil) was instilled. Sulfanilamide may be given with reasonable safety to ambulatory patients. R. Grunfeld.

Goldenberg, A. Z. **Therapy of gonoblennorrhea with albucide.** Viestnik Oft., 1943, v. 23, pt. 1, p. 29.

This is a report of a clinical study on the local use of sodium acetyl sulfanilamide in gonoblennorrhea. Because the concentration of sulfanilamides administered by mouth is lower in the conjunctiva than in any other tissue, the author doubts the effectiveness of its oral administration in conjunctival infections; in addition the sulfonamides are quite toxic in infants, who form the majority of patients with gonoblennorrhea. Sodium acetyl sulfanilamide is soluble in water to a 40-percent concentration. A 30-percent solution was tested on the eyes of rabbits in the laboratory; it was instilled every thirty minutes for four hours and found harmless. The pure powder instilled four times at hourly intervals produced

only a slight transitory conjunctival injection, without any corneal changes. Clinically this therapeutic agent was tried in nine cases of gonoblennorrhea. The conclusions are that this preparation in a 10 to 30 percent concentration is very effective in gonoblennorrhea acquired during delivery; that in such cases the conjunctival sac was sterile after 2 to 3 days treatment; and that early corneal infiltrates absorbed promptly, the ulcers becoming clean and covered with epithelium. The local instillation of this drug caused no toxic symptoms.

The drug was less effective in gonoblennorrhea acquired after birth. In some cases the conjunctiva became sterile in a few days, in others it took 10 to 15 days, and in some the deeper layers of the conjunctiva contained involution forms of the gonococcus for as long as 25 days. It appears therefore that while this agent affects the gonococcus profoundly, it produces complete sterilization only after prolonged instillation. The effectiveness of this drug is insignificant in gonoblennorrhea of adults, even in moderately severe cases. Ray K. Daily.

MacCallan, A. F. **Tumor of conjunctiva simulating tubercle due to trachoma.** Trans. Ophth. Soc. United Kingdom, 1942, v. 62, pp. 79-82.

A man 32 years of age had a tumor of the conjunctiva of the upper lid, with irregular "hob-nail" surface which was called trachoma. Such an unusual type has been described not infrequently in the Baltic coast region. After the surface growth was treated with beta radiation, the mass disappeared very promptly. (2 illustrations.)
Beulah Cushman.

Schnee, I. M. **Membranous inflammation of oropharynx, nose, and conjunctiva due to sulfathiazole.** Brit. Med. Jour., 1943, April 24, p. 506.

Membranous inflammation of the conjunctival, nasal, pharyngeal, buccal, and laryngeal mucosa appeared on the fifth day of sulfathiazole therapy in one-gram doses every four hours, four times daily, for an upper respiratory infection. Cultures for diphtheria were negative. Staphylococci and M. catarrhalis were found. Wassermann and urine tests were negative. When first administered, the drug caused defervescence and relief of symptoms, but the fever returned when the complicating membranous changes appeared. On the ninth day of sulfathiazole therapy the drug was discontinued, and in ten days all the lesions had disappeared. Francis M. Crage.

6

CORNEA AND SCLERA

Ballantyne, A. J. **"White rings" in the cornea** (G. Coats). Trans. Ophth. Soc. United Kingdom, 1942, v. 62, pp. 83-102.

Macroscopic and microscopic examinations of a "white ring" of the cornea are described. The ring was composed of discrete, closely set, apparently globular, chalky-white bodies measuring 1.5 micra. The bodies were refractile rather than obstructive, and were grouped around a central area. They were somewhat irregular in shape and of waxy appearance, and were situated between the epithelium and Bowman's membrane, the base line of the epithelium extending over the cavities. Chemical analysis indicated some calcium salt. In dealing with etiologic factors the author mentions congenital and traumatic cases and those arising from some antecedent intraocular disease. (12 illustrations, references.)
Beulah Cushman.

Barrenechea, S., Contardo, R. and Arentsen, J. **Riboflavin in the treatment of various corneal affections.** Ophth. Ibero Amer., 1943, v. 4, no. 4, pp. 405-421 (in Spanish), pp. 421-434 (in English).

The authors discuss the physiologic role of riboflavin and the symptoms of ariboflavinosis, especially as regards the eye. From these considerations, and from treatment of 109 patients, they draw the following conclusions: Vascularization of the cornea is a mechanism of compensation for obtaining the oxygen of hemoglobin when it cannot be furnished by natural riboflavin. The first dose should be high, 3 to 5 mg. given intravenously, dropping afterward to 2 mg. daily for one week. Corneal ulcer sometimes becomes negative to fluorescein within 12 or 14 hours. Failures with riboflavin are attributed to inadequate dosage, lack of intestinal absorption when the preparation is given by mouth, systemic lack of pantothenic acid, excessively severe ariboflavinosis, or active tuberculosis. Parnechymatous keratitis also appeared to be benefited by a riboflavin dosage of 5 or 6 mg. daily.

W. H. Crisp.

Daily, R. K. **Familial corneal dystrophy.** Texas State Jour. of Med., 1943, v. 39, May, p. 34.

The author records five cases of corneal dystrophy occurring in one family. One pedigree chart and five black and white drawings are included. The corneal dystrophy of the family belonged to the granular type. A short review of the characteristics of the three types of corneal dystrophy is given.

T. M. Shapira.

Gregory, M. K. **The ocular criteria of deficiency of riboflavin.** Brit. Med. Jour., 1943, July 31, p. 134.

Early ocular signs of riboflavin deficiency are discussed. Corneal vascularization is found to be a more reliable sign than the circumcorneal injection which has lately been given more attention.

In the corneal vascularization, the vessels are arranged streamer-like around the cornea in both eyes. The normal anatomy of this area of the eye is discussed, and other pathologic conditions which might present similar pictures are mentioned.

Gertrude S. Hausmann.

Lazarev, E. G. **The absorption of corneal opacities of various etiology.** Viestnik Oft., 1943, v. 22, pt. 1, p. 7.

This is a preliminary report on a procedure designed to hasten the absorption of corneal opacities. In his work with corneal transplantation Filatov noticed the beneficial effect of the operation on the cornea of the host; the opaque cornea around the transplant became more transparent. Filatov attributed this phenomenon to the action of substances which develop in the transplanted cadaver-cornea during the period of its conservation on ice. Lazarev noticed the same effect in a case of transplantation of fresh cadaver-cornea. It then occurred to him that perhaps the beneficial effect was due not to the action of the transplanted cornea, but to excision of a segment from the opaque cornea, thus opening a drainage route for deleterious substances accumulated within the cornea. Lazarev believes that in cases of deep keratitis the intact epithelium obstructs the evacuation of exudates accumulated within the cornea, and that the clearing of corneal opacities can be hastened and promoted by excision of a superficial strip of cornea. He finds support for this belief in the fact that corneal diseases with destruction of corneal

epithelium run a more rapid clinical course than corneal diseases in which the corneal epithelium remains intact. With this idea, in seven cases of tuberculous or luetic parenchymatous keratitis he excised a strip of cornea 2 by 4 mm. in size, with visual improvement in all cases. He subsequently modified the procedure. Now, instead of completely excising a flap, it is left attached at its upper border, hanging from the cornea like an apron. (Illustration.) Ray K. Daily.

Loewenstein, Arnold. **Some contributions to the lipoidal pathology of ocular tissue.** Trans. Ophth. Soc. United Kingdom, 1942, v. 62, pp. 159-167.

The author describes two groups of fatty dystrophy of the cornea. The primary is of unknown origin and shows symmetrical bilateral interstitial involvement with no sign of inflammation or vascularization. The secondary follows such diseases as keratomalacia, herpes, scars, dermoids, and degenerative corneal conditions. The collection of fat is due to a disturbance in the local metabolism where the oxidizing power is not sufficient to oxidize the high quantity of blood fat. (8 illustrations.) Beulah Cushman.

Stone, Simon. **Vitamin E (wheat germ oil) in the treatment of interstitial keratitis.** Arch. of Ophth., 1943, v. 30, Oct., pp. 467-475.

It has been demonstrated that wheat germ oil has a beneficial effect on the absorption of tissue exudates as observed in cases of arthritis deformans, in cases of congenital nonobstructive hydrocephalus, and in selected cases of pseudohypertrophic muscular dystrophy. These observations have led to its use in resistant cases of interstitial keratitis. Ten patients with luetic interstitial keratitis were treated. All had received ample antisyphilitic therapy and six had received fever therapy. The vitamin therapy consisted in the administration of vitamin-E concentrates combined with vitamin-B complex. All ten of the cases treated, even some with long-standing opacities, showed definite improvement.

This combination of vitamin E with B complex hastens the absorption of corneal exudates and opacities. It also prevents further organization of scar tissues of the cornea and reduces excessive capillary permeability. Riboflavine is thought to enhance the action of vitamin E by its beneficial effect on the oxidative processes of the cornea.

It is suggested that, in addition to antisyphilitic therapy, all patients with interstitial keratitis be given a mixture of vitamin E with B complex. Artificial fever is of value in preventing relapses and in producing a more rapid subsidence of acute symptoms.

John C. Long.

Sugar, H. S. **A new material for anterior-segment impressions.** Amer. Jour. Ophth., 1943, v. 26, Nov., pp. 1210-11.

Vail, D., and Ascher, K. W. **Corneal-vascularization problems.** Amer. Jour. Ophth., 1943, v. 26, Oct., pp. 1025-1044; also Trans. Amer. Ophth. Soc., 1942, v. 40, p. 181. (21 figures, references.)

Wetzel, J. O. **Groenouw's corneal dystrophy.** Amer. Jour. Ophth., 1943, v. 26, Nov., pp. 1183-1194. (6 figures, 1 chart, bibliography.)

Zavalia, J. M., and Amado, C. F. **Bilateral iridocyclitis and band opacity of the cornea in Still's disease.** Anales Argentinos de Oft., 1942, v. 3, Oct.-Nov.-Dec., p. 189. (See Section 7, Uveal

tract, sympathetic disease, and aqueous humor.)

7

UVEAL TRACT, SYMPATHETIC DISEASE AND AQUEOUS HUMOR

Meyer, G. P. **Syphilis in relation to the iris and uveal tract.** Jour. Med. Soc. New Jersey, 1943, v. 40, Feb., p. 55.

The author presented this paper as a part of a symposium on syphilis and its relation to eye, ear, nose, and throat. He discusses the incidence of syphilis, roseola of the iris, secondary and tertiary and recurrent syphilitic iridocyclitis, congenital syphilis of the uvea, and diagnosis and prognosis of uveal syphilis. Interesting is a quotation by the author from Weiss, who states that 55 percent of all iritis is luetic.

T. M. Shapira.

Rabinowicz, M. G. **Blood changes in threatened sympathetic ophthalmia.** Viestnik Oft., 1943, v. 25, pt. 1, p. 20.

In spite of the war and industrialization, the frequency of sympathetic ophthalmia following perforating injuries was reduced from 2.90 percent in 1900 to 1918 to 1.72 percent in 1919 to 1935. This is to be attributed to improved prophylaxis, that is, insistence on enucleation of the injured eye in threatened sympathetic ophthalmia. Because of the large number of perforating ocular injuries during the war the diagnosis of threatened sympathetic ophthalmia becomes very important. To point out the difficulty of diagnosis Rabinowicz cites the fact that of 914 eyes enucleated in 1926 to 1934 with the diagnosis of sympathetic ophthalmia, only in 25 was the diagnosis confirmed microscopically. The author reviews the literature on the efforts to find assistance for the diagnosis in the blood morphology, and gives a condensed report of his own studies on 120 patients with severe perforating ocular injuries and severe clinical symptoms of iridocyclitis, acute or chronic. Blood studies, where possible, were made on the day the injury was received, and every other day after that. The data confirm the published findings that monocytosis, when it occurs, does not appear before the eighth or ninth day. Of the 120 case histories 48 contain a histopathologic report; in 72 this was not available. Of eight cases, confirmed histologically as threatened sympathetic ophthalmia, in six there was a high monocytosis, in one a moderate monocytosis, and in one a slight lymphocytosis without monocytosis. The monocytosis found in the seven cases receded very slowly after enucleation. In two cases, one clinically severe and one moderately severe, in which the histologic diagnosis between infiltrating uveitis and endophthalmitis could not be made, there was moderate monocytosis, slowly receding after enucleation. The author believes that the blood morphology of these ten cases supports the already demonstrated relation between monocytosis and sympathetic ophthalmia. In 15 cases with histologically confirmed endophthalmitis, monocytosis was absent. In 17 cases of uveitis, histologically lacking the characteristics of sympathetic ophthalmia, there was high monocytosis in five cases, moderate in six, and none in six. The degree of monocytosis ran parallel with the severity of the clinical symptoms. Of the 72 clinical case histories without histologic data, in 68 there was complete correlation between the monocytosis and the severity of the clinical symptoms. The author believes that the blood picture is a very sensitive indi-

cator of infection, and that monocytosis develops prior to demonstrable histologic processes. The slow recession of the monocytosis after enucleation shows that the infection remains in the blood for some time, and explains the occurrence of sympathetic ophthalmia several weeks after enucleation of the injured eye. Ray K. Daily.

Zavalia, J. M., and Amado, C. F. **Bilateral iridocyclitis and band opacity of the cornea in Still's disease.** Anales Argentinos de Oft., 1942, v. 3, Oct.-Nov.-Dec., p. 189.

Still's disease is a form of rheumatism or arthritis, resulting from a chronic infectious process caused by the streptococcus viridans. The portal of entry is the throat, teeth, or sinuses. The ailment occurs principally in children, although an adult form has been described. The case now reported is that of a boy of ten years in whom the disease had appeared at the age of one year, as small painless cysts of the wrist and knees, with progressive enlargement. The child was poorly developed and showed polyglandular swellings and marked deformities of the extremities. Each eye presented a transverse film of the cornea, scleral staphyloma, and chronic iridocylitis. A blood culture showed a gram-positive streptococcus. The literature is reviewed and discussed. (4 figures.)

Eugene M. Blake.

8

GLAUCOMA AND OCULAR TENSION

Alexander, G. F. **Depletion of the vitreous in glaucoma.** Trans. Ophth. Soc. United Kingdom, 1942, v. 62, pp. 153-157.

The author describes a decompression operation on the sclera, with drainage of the vitreous, in eyes blind from old injuries or chronic glaucoma.

Beulah Cushman.

Marshal, J. C. **A case of chronic glaucoma complicated by detachment of the retina.** Trans. Ophth. Soc. United Kingdom, 1942, v. 62, pp. 149-151. (See Section 10, Retina and vitreous.)

Martin, J. E. **Atropine glaucoma.** Brit. Med. Jour., 1943, May 22, p. 631.

Old age is no contraindication to the use of atropine. When full mydriasis and cyloplegia are required we should use the drug boldly by the subconjunctival route. But efficient drainage of the aqueous must always be proved beforehand. R. Grunfeld.

Schoenberg, M. J. **Is glaucoma a deficiency disease? Important details concerning the nonsurgical treatment of glaucoma simplex.** Amer. Jour. Ophth., 1943, v. 26, Dec., pp. 1282-1288. (4 illustrations.)

9

CRYSTALLINE LENS

Carleton, Alice. **Skin disease and cataract.** Brit. Jour. Derm. and Syph., 1943, v. 55, April, p. 83.

The skin diseases in which juvenile cataract may occur are allergic eczema, poikiloderma, and scleroderma.

Cases of allergic eczema in association with cataract are briefly reviewed. In the discussion of the investigation of others, the author brings out the fact that in allergic eczema no specific allergen has ever been proved. A case of familial telangiectasia and cataract with myotonic dystrophy is described. These skin diseases are said to be genetically inherited, though the type of genetic inheritance is different in each.

Francis M. Crage.

Guyton, J. S., and Woods, A. C. **Oral use of prophylactic sulfadiazine for cataract extractions.** Amer. Jour. Ophth., 1943, v. 26, Dec., pp. 1278-1282.

Neblett, H. C. **Choroidal detachment following cataract extraction.** Southern Med. and Surg., 1943, v. 105, May, p. 225.

Choroidal detachment occurs in 4 percent of the cases after cataract extraction. That it is not observed more often is attributable to the fact that many surgeons do not examine the fundus in the first eight to ten days after the operation and the detachment becomes reattached within ten days without any visible evidence of its former presence. The detachment is produced by injury of the ligamentum pectinatum during the operation, allowing aqueous humor to filter into the space below the choroid. Or it may be caused by the rupture of a choroidal vessel.

Subjectively the patient will complain of a dull, heavy feeling in the eye. Objectively a hemorrhage in the anterior chamber may be found. The wound margins are swollen, the anterior chamber is shallow, the globe is soft to palpation. Ophthalmoscopic examination will reveal a smooth, round, nonfluctuating, brownish-gray mass protruding into the vitreous and arising from either the nasal or the temporal half of the fundus.

One case history is given. A 55-year-old man had been operated upon for cataract. The operation and the postoperative course were uneventful until the eighth day, when the detachment of the choroid was noted. The choroid became reattached after the twelfth day. A few scattered areas of pigmentation in the retina were noted at the site of the previously detached choroid.

R. Grunfeld.

Shah, M. A. **Cataract in untreated cases of diabetes mellitus.** Indian Med. Gazette, 1943, v. 78, Feb. p. 71.

The author reports 36 cases of cataract in untreated cases of diabetes mellitus. The diabetes was mostly of the moderately severe type and the cataracts of the senile cortical variety. The incidence of cataract increased with the age of the patient, and the duration of the cataract varied from one to 12 years.

R. Grunfeld.

Wolfe, O. R., Wolfe, R. M., and Georgariou, P. **Discission of congenital (cataractous) dislocated lens.** Amer. Jour. Ophth., 1943, v. 26, Dec., pp. 1313-1314.

10

RETINA AND VITREOUS

Craik, K. J. W. **Specifications for dark-adaptation tests.** Brit. Med. Jour., 1943, May 22, p. 632.

To use the dark-adaptation tests intelligently and to enable one to compare the findings of different observers, standardization is necessary. That is, agreement must be reached as to size of field, form or figure used in the test, quality of light, duration of exposure, retinal area to be tested and so on. Moreover, there is an equal need of calibration, or of exact measurement of the physical properties of the instrument, to enable one to produce an exact copy of the instrument.

R. Grunfeld.

Ebert, R. H. **Angioid streaks and pseudoxanthoma elasticum.** Arch. Derm. and Syph., 1943, v. 48, July, pp. 75-82.

Ebert describes angioid streaks, ophthalmoscopically, as jagged, irregular streaks, in some cases radiating in spokelike fashion from the region of the discs, in others anastomosing and intersecting. Angioid streaks were associated with serious pathological alterations of the macula in 140 of 188 cases, as covered by one review. The differential diagnosis is discussed briefly by Ebert. Pseudoxanthoma elasticum is characterized by yellow plaques, occurring especially in the skin folds. It is symptomless. Pathologically, there is destruction of elastic fibers in the skin. The degenerated elastic fibers are rich in calcium.

The cause of each of these diseases is unknown, but both are rare, and they are too frequently associated for the experience to be coincidental. Ebert stresses the points of similarity, and cites statistics correlating the two conditions. The pathology of angioid streaks is uncertain, the evidence conflicting. Verhoeff found folds in Bruch's membrane and the choriocapillaris, but the remaining eye showed no angioid streaks; Law found a similar appearance of folds, but did so in an eye sectioned after being in fixatives several months. In Benedict's case, no retinal pathology was found. Bock and Hagedoorn observed cases showing in Bruch's membrane atrophic changes which by serial reconstruction resembled angioid streaks seen ophthalmoscopically. Apparently the two diseases are related instances of disease of the elastic tissue, but their exact nature has not yet been determined. Benjamin Milder.

Huggett, A. S., and Juler, F. A. **Heparin in thrombosis of the central vein of the retina.** Trans. Ophth. Soc. United Kingdom, 1942, v. 62, pp. 123-134.

The use of heparin in the treatment of seven cases of retinal thrombosis is described by the author. Constitutional reactions occurred in six cases. They consisted of pyrexial attacks which did not recur upon reduction of the next dose. In some cases hemorrhages occurred in arm, leg, or finger in connection with the punctures used for intravenous administration or in collection of blood from other parts of the body for estimation of the coagulation time.

An increase in the retinal hemorrhage of the affected eye was noted in five cases, and small retinal hemorrhages in the unaffected eye in one case. One patient had slight epistaxis.

The authors conclude that it is impossible to attribute any benefit to this drug, and that its administration is not without danger. (One table, references.) Beulah Cushman.

McLane, J. N. **Retinal hemorrhage in a case of rattlesnake bite.** Jour. Florida Med. Assoc., 1943, v. 30, July, p. 22. (See Section 16, Injuries.)

Marshall, J. C. **A case of chronic glaucoma complicated by detachment of the retina.** Trans. Ophth. Soc. United Kingdom, 1942, v. 62, pp. 149-151.

A patient with a separated retina was found to have complete cupping of the disc when the nerve became visible after the operative interference. The tension had been normal at all times during preliminary observation. Two other cases of glaucoma with separated retina are reported.

Beulah Cushman.

Mattos, W. B. (with "V.J."). **Self-observation of retinal detachment.** Arquivos Brasileiros de Oft., 1943, v. 6, June, pp. 63-67.

See editorial, this issue, page 189.

Riddell, W. J. B. **On testing dark adaptation.** Glasgow Med. Jour., 1943, v. 21, June, pp. 149-157.

The author describes his modification of the Birch-Hirschfeld adaptometer, so arranged that a relatively constant portion of the retina is tested, in an area where there is an approximately equal distribution of rods and cones. The paper is essentially a series of generalizations concerning the testing of dark adaptation. The author describes the wide range of light intensities covered, necessitating the logarithm unit for plotting the curves of dark adaptation. The varying sensitivity of rods and cones to light of different wave-lengths is discussed, as well as the variations in the cone-rod transition-time produced by varying the preliminary light-adaptation period. The paper stresses the importance of studying the entire curve of dark adaptation, rather than just the final rod-threshold, in correlating nutritional studies with organic disease such as hepatic cirrhosis. Benjamin Milder.

Wolff, Eugene. **Retinitis proliferans.** Trans. Ophth. Soc. United Kingdom, 1942, v. 62, pp. 115-122.

The author discusses the fate of the blood after a vitreous hemorrhage. He describes a microscopic specimen in which the fluid remained and tended to form a blood cyst. The membranous wall (retinitis proliferans) was traced over the internal limiting membrane of the retina. It suggested separated vitreous and contained blood elements. (3 illustrations, references.)

Beulah Cushman.

Yudkin, J., and Ferguson, A. **A critique of the Bishop Harman test for night vision.** Brit. Med. Jour., 1943, May 22, p. 632.

The authors critically analyze Harman's new apparatus for measuring night vision. The apparatus consists of groups of white discs mounted on a black background and illuminated by a standard candle five meters away. After 15 minutes of dark adaptation the subject is required to stand at such a distance that he is just able to distinguish the discs and count them. A shorter distance indicates poorer, a greater distance, better night vision.

The analysis reveals that the instrument is faulty in many respects on theoretical consideration. It proved also to be unsatisfactory on practical application. The dark adaptation of thirty subjects was examined with this apparatus and compared with the results obtained on the Haines instrument. The results obtained by the two instruments showed but little correlation. R. Grunfeld.

Yudkin, J., Robertson, G. W., and Yudkin, S. **Vitamin A and dark adaptation.** Lancet, 1943, v. 245, July, pp. 10-13.

Using an instrument modified from the Crookes adaptometer, the authors measured the complete course of dark adaptation in four hundred subjects. By their technique, after light-adapting the subject, the retinal threshold was measured repeatedly over a period of forty minutes. Their graphs show, typically, an initial rapid adaptation (the "cone threshold") followed by a slower adaptation (the "rod threshold"). The authors stress the importance of evaluating dark adaptation in terms of the entire function—that is, the cone threshold, the rod threshold, the transition time between these two phases, and the final rod-threshold level. They believe that the adaptometers which measure the visual threshold at one

particular time are misleading, and in many cases erroneous. If one single criterion is to be selected, it should be the final rod-threshold.

The authors made an intensive study of the influence of altered vitamin-A intake (marked increases and decreases) on the dark adaptation of a series of normal individuals, and found that alterations in any of the phases of the dark adaptation curve were possible, but the most constant changes were in the final rod-threshold—the condition approaching complete dark-adaptation. Benjamin Milder.

11

OPTIC NERVE AND TOXIC AMBLYOPIAS

Doggart, J. H. **On diagnosing papilledema.** Trans. Ophth. Soc. United Kingdom, 1942, v. 62, pp. 141-144.

The author mentions the following objective signs of papilledema as of value in forming an opinion as to the significance of swelling of the disc during the early stages: (1) slight parallax movement, (2) the impression of a slight forward thrust of the disc (one diopter or more), (3) turgidity of veins, (4) alteration in the light reflex of vessels crossing the edges of the disc, (5) hemorrhages, (6) partial or total obliteration of the physiologic cup, (7) enlargement of the blind-spot, (8) blurring of the disc edges.

Beulah Cushman.

Leinfelder, P. J. **Choked discs and low intrathecal pressure occurring in brain tumor.** Amer. Jour. Ophth., 1943, v. 26, Dec., pp. 1294-1298; also Trans. Amer. Ophth. Soc., 1243, v. 41. (One table, references.)

Neame, Humphrey. **Congenital hole in the optic disc, with a scotoma.** Trans. Ophth. Soc. United Kingdom, 1942, v. 62, p. 137.

The author reports the case of a patient who had a hole in the optic disc. The lower half of the visual field was lost up to the area of fixation. The tension was normal and there was no pathologic cupping of the disc. One other patient with a hole in the disc had no visual-field changes.

Beulah Cushman.

Voss, O. **Neurolysis of the optic nerve.** Zentralblatt für Chirurgie, 1942, v. 69, April, pp. 595-601.

A woman of 47 years sustained a severe fracture of the base of the skull in an automobile accident. The right eye had to be enucleated. After convalescence was completed, gradual deterioration of the visual acuity of the remaining eye was noticed. There was temporal hemianopsia, but central vision was fairly good. Other neurological findings were normal.

Operation was performed under local anesthesia after preliminary luminal. Dandy's technique was used, the skin flap being reflected forward and the bone flap toward the temporal region. The opening of the bone flap was attended by considerable difficulty, the dura being quite generally adherent to the bone. The surface of the brain showed a marked arachnoiditis, particularly in the frontal pole and along the superior sagittal sinus. After various anatomic preliminaries, there was found an unmistakable arachnoiditis of the cisterna of the chiasm. The left optic nerve was wrapped in scar tissue of appreciable thickness, contraction of which was unmistakably causing pressure upon the nerve. There was apparently no pathologic condition of the bone in the region of the optic foramen, particularly in the form of an exostosis,

and the nerve appeared normal outside of the scarred area. All the adhesions were separated with a hook, leaving the nerve entirely free. The scar tissue which had surrounded the nerve was split and partly removed, as also were the arachnoidal adhesions in the vicinity. There were similar conditions on the right side, but no resection was undertaken here, because of the absence of the right eye. Several weeks later the patient showed no further advance in visual disturbance. The visual field had undergone no further change. The patient returned to her work as librarian.

In the second patient, a soldier who had been injured by a grenade from which several splinters were lodged in the anterior cranial fossa, the technique of operation was similar to that in the first patient. In attempting to approach the chiasm, the anterior pole and the floor of the right frontal lobe were found extensively adherent to the dura. Parts of the frontal pole were resected, the frontal lobe freed from the floor of the anterior fossa, and the right optic nerve gradually exposed. There was a good deal of scar formation, the optic nerve itself being surrounded by a circular callous. The latter was split in the direction of the nerve fibers. It was then found that peripherally from the chiasm the right nerve had been torn half way through on its medial side by a rather small irregular grenade splinter which was still in place. The circular mass of scar tissue was excised as accurately as possible, and arachnoidal adhesions in the angle of the chiasm were also divided. The left nerve was macroscopically normal. Postoperative convalescence was complicated by necessity for repeated puncture to get rid of accumulations of fluid beneath the skin flaps, and also by a mild meningeal infection. But the visual disturbances went no further and the patient's general condition was considerably improved, with disappearance of severe headache which had existed before the operation.

The author suggests that the optic nerve has a materially greater capacity for regeneration than an ordinary spinal nerve. (3 illustrations.)

W. H. Crisp.

12

VISUAL TRACTS AND CENTERS

Goldstein, Kurt. **Some remarks on Russel Brain's article concerning visual object-agnosia.** Jour. Nerv. and Ment. Dis., 1943, v. 98, Aug., p. 148.

The author disputes Brain's assumption that the disturbance of recognition in the case of visual agnosia, which the author has described, was due to impairment of perception and specifically to a defect of the visual field, for the visual field in this case was almost normal. The patient's defect can be understood only as an impairment in the perceptual sphere concerning the degree of form perception, and it warrants a special name, that of visual agnosia.

R. Grunfeld.

Mahoney, V. P., and Linhart, W. O. **Amblyopia in hysteria.** War Medicine, 1943, v. 3, May, p. 503.

The authors report 13 cases of hysterical amblyopia. Laboratory work-up psychobiologic studies and ocular examinations including form and red fields, were made on these patients. Concentrically contracted fields and characteristic disturbances of personality were found. Acute, chronic, and mixed types were noted. The authors remind us that hysterical amblyopia occurs in psychobiologically underdeveloped persons and is akin to an acute

hysteric reaction. These cases should be referred to a psychiatrist.

Francis M. Crage.

13

EYEBALL AND ORBIT

Harley, R. D. **Exophthalmos in the newborn.** Amer. Jour. Ophth., 1943, v. 26, Dec., pp. 1314-1315.

Reese, A. B., and Khorazo, D. **Endophthalmitis due to B. subtilis following injury.** Amer. Jour. Ophth., 1943, v. 26, Dec., pp. 1251-1253. (References.)

Sudakevich, D. I. **Orbital prothesis for the sequelae of war injuries.** Viestnik Oft., 1943, v. 23, pt. 1, p. 25. (See Section 16, Injuries.)

Sunder-Plassmann, P. **Malignant exophthalmos.** Zentralblatt für Chirurgie, 1942, v. 69, Jan. 17, pp. 88-92.

The author's introduction includes mention of a clinical case in which perforation of the corneas rendered bilateral enucleation necessary. The patient whose case report occupies most of the article was a woman of 55 years who, after an accident in which she was in fear of death, developed malignant exophthalmos which failed to yield to prolonged treatment with various forms of medication, as well as by excision of conjunctiva and the use of X rays to the hypophysis. The eye surgeon stated that both eyes were in immediate danger of spontaneous perforation.

Radical operation was therefore undertaken in accordance with Naffziger's technique. The patient was trephined on each side, with formation of bone flaps carrying the temporal muscles. The ventricles were punctured, the basal dura pushed aside, and the frontal lobes drawn backward. Both orbits were completely decompressed, and the orbital fascia was opened and the individual eye muscles exposed, with avoidance of the frontal branch of the trigeminal nerve. The levator palpebrae, the superior rectus, the internal rectus, and the lateral rectus were found tremendously enlarged, to about the thickness of a thumb. They were firmly adherent to one another, and had to be separated with a fine scalpel. The roof of the optic-nerve canal on each side was decompressed almost as far back as the hypophysis. There was severe edema of the optic nerve on each side, but no change in the orbital fat. At the close of the operation the dura and frontal lobe rested directly on the eyeballs. The patient made a fine recovery, although in the first two days she had a periphlebitis of the leg. There was no longer necessity for the morphine under which it had been necessary to keep the patient before the operation. The exophthalmos rapidly receded. Three months after the operation there was perfect closure of the eyes, and the corneal ulcers had long since healed. The eye clinic reported "normal visual acuity" and good motility of the eyeballs. A year after the operation the patient had gained 35 pounds, and was carrying on all her activities upon a farm. The author states this to be, so far as he knows, the first case of extreme malignant exophthalmos to be operated upon bilaterally in Germany with successful result. (5 illustrations.) W. H. Crisp.

Tucker, John. **Hand-Schüller-Christian disease (idiopathic xanthomatosis).** Cleveland Clinic Quarterly, 1943, v. 10, July, p. 55.

Hand-Schüller-Christian disease occurs most frequently in children under

two years of age. The principal manifestations of the syndrome are osseous xanthoma (producing defects in the membranous bones of the skull), exophthalmos, and diabetes insipidus.

A case of Hand-Schüller-Christian syndrome is reported. X-ray treatment caused extensive healing of the bony defects of the skull. The use of pitressin tannate simplified the treatment of the diabetes insipidus. (6 illustrations.)

Gertrude S. Hausmann.

14

EYELIDS AND LACRIMAL APPARATUS

Costa, O. G. **Microsporon infection of the palpebral and ciliary regions.** Arch. Derm. and Syph., 1943, v. 48, July, pp. 65-69.

Costa reports a case of tinea due to Microsporon felineum, in a negro boy. The lesions occurred on the scalp, ears, eyelids, and lashes, producing on the latter a patchy pseudoalopecia and some trichiasis. The diagnosis was supported by culture, mycologic examination and trichophytin test. The infection is usually transmitted by cats and dogs. (3 photographs.)

Benjamin Milder.

Seemen, Hans. **A rare disfigurement from scalping—result of new type of restorative operation.** Zentralblatt für Chirurgie, 1942, v. 69, Aug., pp. 1280-1287.

The hair of a 15-year-old girl was caught in a drive belt, with complete scalping accompanied by shock, and followed by fever, purulent secretions from the wound, and bad general condition. There was complete loss of the hairy scalp with the exception of slight remains just behind the attachments of the auricles. The right external ear had also been torn off and the defect scarred. Except over the root of the nose, the whole skin of the frontal area had been destroyed, including eyebrows and upper lids, with secondary bilateral ectropion. The outer halves of the lower lids were drawn upward, so that the palpebral fissure on each side was strikingly oblique. In normal position of the head, the lower half of the eyeball was covered by the lower lid, the upper margin of the lower lid bisecting the iris and pupil. The ectropion of the upper lids was so great that the eyelashes were turned directly backward. The eyelids could not be completely closed. The surgical procedures included steps for replacement of the scarred frontal skin with sound skin and reconstruction of the eyebrows. The transplanted skin was obtained from the side of the neck and the upper part of the chest. For the eyebrows, advantage was taken of the small remains of the hairy scalp, with special care to have the direction of the hair run from medial to lateral. Complete restoration of lid function was obtained, and the primarily existing "mongolian" facies was fully overcome. (14 illustrations.)

W. H. Crisp.

NEWS ITEMS

Edited by DR. DONALD J. LYLE
904 Carew Tower, Cincinnati

News items should reach the editor by the twelfth of the month

DEATHS

Dr. Ned A. Balding, Lincoln, Illinois, died October 6, 1943, aged 57 years.

Dr. Thomas V. Connolly, Paterson, New Jersey, died October 21, 1943, aged 53 years.

Dr. Vance M. Cox, Bristol, Virginia, died October 15, 1943, aged 63 years.

Dr. Zenas H. Ellis, New York, New York, died October 20, 1943, aged 48 years.

Dr. George F. Fiske, Chicago, Illinois, died October 18, 1943, aged 83 years.

Dr. Stephen A. Hemmi, Chicago, Illinois, died October 27, 1943, aged 85 years.

Dr. George F. Scheib, Champaign, Illinois, died November 2, 1943, aged 76 years.

Dr. Oscar O. Larsen, Detroit Lakes, Minnesota, died November 7, 1943, aged 66 years.

Dr. Douglas A. Payne, Chicago, Illinois, died November 24, 1943, aged 86 years.

MISCELLANEOUS

Dr. William H. Crisp, Consulting Editor and Head of the Abstract Department of the American Journal of Ophthalmology, is anxious to learn whether any ophthalmologist in this country is familiar with the Turkish language. The first issue of a new Turkish eye journal has just been received. Please communicate with Dr. Crisp, 530 Metropolitan Building, Denver, Colorado.

The executive office of the American Board of Ophthalmology has been moved to P.O. Box 1940, Portland 2, Maine. Officers for 1944 are the following: Dr. John Green, Saint Louis, chairman; Dr. Frederick C. Cordes, San Francisco, vice-chairman; Dr. S. Judd Beach, Portland, secretary-treasurer; and Dr. Theodore L. Terry, Boston, assistant secretary. The 1944 examinations will be held in New York, on June 3d and 4th; and in Chicago, on October 5th to 7th.

Announcement is made that the Directory of Medical Specialists is now to be published by the A. N. Marquis Company of Chicago, publishers of "Who's who in America." Previous editions have been published for the Advisory Board for Medical Specialties by the Columbia University Press of New York City.

It is planned not to issue the next edition before 1945, on account of the war, but the A. N. Marquis Company will publish a supplemental list of all those who have been certified by the American Boards since the last (1942) edition of the Directory, totaling about 3,600. This is to be distributed at cost, and monthly or bimonthly bulletins listing successful candidates for certification at examinations during the additional interim before the next edition, are to be issued as a subscribers' service.

Dr. Paul Titus (Pittsburgh) of the American Board of Obstetrics and Gynecology will continue as the Directing Editor, and Dr. J. Stewart Rodman (Philadelphia) of the American Board of Surgery continues as Associate Editor. The Editorial Board will be composed, as before, of the secretaries of the 15 American Boards.

Communications should be addressed to the Directing Editor, Directory of Medical Specialists, 919 North Michigan Avenue, Chicago 11, Illinois.

SOCIETIES

The Washington, D.C., Ophthalmological Society held its regular meeting on January 10th. The guest speaker was Dr. Maynard C. Wheeler, New York City, who spoke on "Surgical treatment of vertical deviations." The following cases were presented: "Melanoma of the choroid" by Dr. Sterling Bockoven, "Parinaud's oculoglandular syndrome" by Dr. Frank D. Costenbader, and "An unusual case of hyalitis" by Dr. C. Robert Naples.

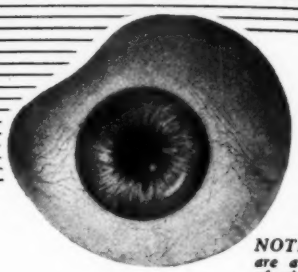
The Research Study Club of Los Angeles held its thirteenth annual postgraduate clinical conference in ophthalmology and otolaryngology January 17th to the 29th. Among the guest speakers were Dr. James Watson White of New York and Dr. Georgiana M. Dvorak-Theobald of Oak Park, Illinois.

A meeting of the Association for Research in Ophthalmology will be held on Tuesday, June 13, 1944, at the Hotel Sherman, Chicago. Applications for places on the program are being received and all communications should be mailed to the secretary, Major Brittain Payne, School of Aviation Medicine, Randolph Field, Texas.

PERSONALS

Dr. Erich Pressburger announces the removal of his offices to Suite 1436, 450 Sutter Building, San Francisco 8, California.

PERFECTED *Plastic* ARTIFICIAL EYES



NOTE: No stock eyes are available . . . all plastic eyes are molded and made to order to meet individual requirements.

Eye physicians will find definite benefits in the new perfected **plastic** artificial eyes:

NON-SHATTERABLE CONSTRUCTION saves the wearer the inconvenience, embarrassment and expense of accidental breakage. Plastic eyes do not discolor, become brittle, roughen, crack, or explode.

ANATOMICAL SHAPES ARE POSSIBLE. Impression molds of the socket are made, affording accuracy of detail to correct faulty conditions. **Especially successful in cases of trauma due to chemical burns, gas explosion, causes incident to war, shrunken sockets, deformed or shrunken eyelids.**

LIFELIKE APPEARANCE. Due to special characteristics of the acrylic compound, plastic eyes absorb more light and reflect less than glass eyes. Sclera and iris have a softer and more lifelike appearance. Cosmetic effects not obtainable with glass eyes are achieved.

GREATER COMFORT is assured because of more accurate fitting and the possibility of adapting plastics through molding of delicate tissue.

NOT CHEMICALLY AFFECTED. The acrylic materials of which plastic eyes are made absorb much less water than glass and are not affected by chemical reaction of the eye socket secretions.

SERVICE TO PHYSICIANS

Eye physicians are invited to contact us regarding patients for whom plastic eyes offer apparent advantages due to special conditions.

Our pamphlet of instructions for ordering Gougelman Perfected Plastic Eyes gratis on request.

Distributors:

AMARILLO
Broome Optical Co.

BALTIMORE
Bowen & King

BOSTON
Mager & Gougelman, Inc.

BUFFALO
Gibson & Doty

CHICAGO
Mager & Gougelman, Inc.
Uhlemann Optical Co.

CINCINNATI
J. Harry McDonald

CLEVELAND
Mager & Gougelman, Inc.

COLUMBUS
Howard—Opticians

DALLAS
Barnett & Wright Opt. Co.

DAYTON
Uhlemann Optical Co.

DETROIT
Mager & Gougelman, Inc.

DES MOINES
Barnett & Ramel Opt. Co.

EVANSVILLE
Ridgway's

FORT WORTH
Dietz Optical Co.

LITTLE ROCK
Barnett & Ramel Opt. Co.

LOS ANGELES
Superior Optical Co.

MINNEAPOLIS
Mager & Gougelman, Inc.

NASHVILLE
John S. Milam Optical Co.

NEWARK
Charles Steigler

NEW YORK
Mager & Gougelman, Inc.

OMAHA
Barnett & Ramel Opt. Co.

PANAMA, R.P.
Scadron's

PHILADELPHIA
McIntyre, Magee & Brown

PITTSBURGH
Mager & Gougelman, Inc.

READING, PA.
Berks Optical Co.

ROCHESTER, N.Y.
E. E. Bausch & Son Co.
Waldert Optical Co.

SEATTLE
Western Optical Co.

ST. LOUIS
Mager & Gougelman, Inc.

SALT LAKE CITY
Western Optical Co.

SAN FRANCISCO
A. H. Parsons

TOLEDO
Uhlemann Optical Co.

WASHINGTON, D.C.
Mager & Gougelman, Inc.

YAKIMA, WASH.
Physician's Optical Co.

CANADA
Montreal
Barlow & Barlow
Imperial Optical Company
All Important Cities of Canada

Paul Gougelman Company

30 NORTH MICHIGAN AVENUE • CHICAGO, ILLINOIS